

Grasses of southern Africa

The background of the cover is a photograph of tall, slender grasses with feathery seed heads, likely a species of Panicum or similar, blowing in the wind. The grasses are green and brown, set against a bright blue sky with scattered white clouds. The overall composition is dynamic and naturalistic.

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GRASSES OF SOUTHERN AFRICA



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MEMOIRS OF THE BOTANICAL SURVEY OF SOUTH AFRICA No. 58
MEMOIRS VAN DIE BOTANIESE OPNAME VAN SUID-AFRIKA No. 58

GRASSES OF SOUTHERN AFRICA

an identification manual with

keys, descriptions, distributions, classification and
automated identification and information retrieval
from computerized data

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ISBN 0 620 14846 2



National Botanic Gardens / Botanical Research Institute
Nasionale Botaniese Tuine / Navorsinginstituut vir Plantkunde
South Africa – Suid-Afrika

1990

Dedicated to

LUCY KATHLEEN ARMITAGE CHIPPINDALL CROOK

author of

A Guide to the Identification of Grasses in South Africa

1955

FOREWORD

The aim of the amalgamated National Botanic Gardens and Botanical Research Institute is to improve the quality of life of the peoples of southern Africa through the use of our plants. It is therefore fitting that this first publication of the new organization should be on such an economically important plant family as the grasses. This manual for grass identification is the long-awaited successor to L.K.A. Chippindall's 'A guide to the identification of grasses in South Africa' in Meredith's *Grasses and Pastures of South Africa*. Published in 1955, 'Chipp' has long been out of print and the price it commands as Africana puts it beyond the means of those who need to use it. More important, our knowledge of grasses has increased greatly over the past 35 years, as can be seen from the following: there has been a revolution in basic classification of the grass family; improvements have been made to the taxonomy of a number of large genera (e.g. *Aristida*, *Digitaria*, *Ehrharta*, *Hyparrhenia*, *Pentaschistis*, *Stipagrostis*); in southern Africa extensive field study of grasses in recent years has resulted in a more complete list of known species, in better records of species distributions and in a better understanding of the relationships of many species.

Concurrent with this increase in knowledge of grasses, the past fifteen years have seen the application of computerization procedures to plant taxonomy. This book is the next stage of development for the *List of species of southern African plants edns 1 and 2*, produced from the PRECIS computer system at the National Herbarium, Pretoria, and is a first step in extending PRECIS to include descriptive characteristics. The linking of our species data to world generic data recorded by L. Watson at the Australian National University, Canberra, to provide a basic reference for regional floristics foreshadows increasing efforts of taxonomists worldwide to co-ordinate their work through computerization. This co-operation is especially important in a plant family such as the grasses, which is of high economic and ecological importance and has many genera that extend beyond national and continental boundaries.

The Grasslands Research Centre (Department of Agricultural Development) provided the funds that made this publication possible. The book is therefore an example of cooperation not only of taxonomists, ecologists and computer scientists within and outside South Africa, but also demonstrates cooperation between a State Department, a Statutory Board (NBG/BRI) and various Universities. Without the inspiring leadership of Beth Gibbs Russell this would not have been possible, and she and her co-workers richly deserve the recognition that this publication should bring.

J.N. Eloff
Director of Research
National Botanic Gardens / Botanical Research Institute

Pretoria, January 1990

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PREFACE

Responsibilities of each author

Major responsibilities were borne by each of the seven authors as listed below, but there has been much critical exchange and sharing of jobs at all stages of the project.

H.M. Anderson: Arundinelleae, various genera in Paniceae; preparation of bromides for illustrations, page lay-out.

N.P. Barker: Arundinoideae; computerization and production of distribution maps from PRECIS.

M.J. Dallwitz: programming of DELTA and its associated programs, CONFOR, KEY, INTKEY and TYPSET.

L. Smook (Fish): Aristideae, *Eragrostis*, *Panicum*; generic keys, herbarium and Specimen-PRECIS curation.

G.E. Gibbs Russell: Andropogoneae, Ehrharteae, various genera in other tribes; overall planning, additional descriptive data for Watson's world generic database, generic keys, generic descriptions, introductory text, glossary, index, typesetting, page lay-out.

M. Koekemoer: Chloridoideae, Pooideae, various genera in Paniceae; spikelet photographs, production of distribution maps, applications of DELTA, continuity of work at PRE, page lay-out, cover photograph.

L. Watson: Computerization of world generic data; subfamily and tribal classification; generic descriptions.

Several specialists contributed treatments of genera in which they have particular expertise: H.P. Linder, University of Cape Town, and R.P. Ellis, Grassland Research Centre, *Pentaschistis*; P.D.F. Kok, University of Pretoria, *Digitaria*; T.M. Sokutu, University of Transkei, *Aira*, *Arrhenatherum*, *Avena*, *Deschampsia*, *Holcus*, *Koeleria*, *Lophochloa*; and E.R. Robinson, University of the Witwatersrand, *Cortaderia*.

Acknowledgements

We thank first O.A. Leistner, editor of the *Memoirs*, for his unfailing support for the project and his willingness to

discuss any aspect on short notice. Wilma Roux has not only drawn many of the illustrations, but has also kept track of all the illustrative material and has cheerfully worked long hours to set up the pages. Others whose help has been essential for the project include Adela Romanowski, who took pains to make excellent prints of the spikelet photographs; R.P. Ellis, who provided copies of photomicrographs of leaf blade anatomy for about 40 species to add information to the generic database, and who was always willing to discuss problems; R.J. Pankhurst, who advised on key generation; J. Erasmus, of the Soils and Irrigation Research Institute, who helped us to get an earlier version of DELTA running on the VAX 11/750 computer at his Institute; Mr Steyn and Mr Venema of Unisys and Mr Swanepoel of the Department of Agricultural Development who solved datacommunications problems between the Burroughs mainframe and the plotter; Mr P.S.J. Hartzenberg of the Department of Agricultural Development who gave facilities to make the bromides of the illustrations; Emsie du Plessis and Beverley Momberg who helped with proofreading; Esme Bense, Irma Bense, Annemarie van Rensburg and Gary van Rensburg of Remata D.T.P. Bureau and Printers, who printed the text bromides from DELTA-generated computer files; and B. de Winter, R.P. Ellis, O.A. Leistner and H.P. Linder, who suggested improvements to the Introduction.

Permission to use previously published illustrations has been granted by the following: British Crown Copyright, reproduced with permission of the Controller, Her (Britannic) Majesty's Stationery Office, and the Trustees, Royal Botanic Gardens, Kew, for *Coix lacryma-jobi*, *Elymandra grallata*, *Entolasia imbricata*, *Lepturus repens*, *Monocymbium ceresiiforme*, *Odontelytrum abyssinicum*, *Oxytenanthera abyssinica*, *Schizachyrium sanguineum*, *Schoenefeldia transiens*, *Sporobolus subtilis*, *Streblochaete longiaristata*, *Thelepogon elegans*, and *Vossia cuspidata*; the Editorial Board of *Flora Zambesiaca*, for *Sartidia angolensis*; Penguin Books Ltd., reproduced by permission, from C.E. Hubbard, 1954, *Grasses*, illustrations copyright Joan Sampson, for *Agropyron repens* (p. 76), *Ammophila arenaria* (p. 262), *Cynosurus echinatus* (p. 192), *Deschampsia caespitosa* (p. 226) and *Parapholis incurva* (p. 317). We especially thank M.A.N. Mueller, of the Namibia Herbarium, Windhoek (WIND), who generously lent us the original plates by Blythe Pascoe (Loutit) used for his own book, *Grasses of South West Africa / Namibia*.

INTRODUCTION

Importance of the grasses

The grasses are the most important plant family on earth, in numbers of individuals, biomass, area covered, diversity of habitats and value to man. Over 30 % of the land area of the earth is covered in natural grassland and savanna vegetation dominated by grasses (Walter 1979). Grasses occur in the tropics, in the arctic and antarctic, in swamps and deserts and forests, on mountaintops and seashores. The most widespread flowering plant species, *Phragmites australis*, is a grass (Good 1974). The major part of the land area devoted to crops is occupied by the great cereals, maize, wheat, and rice, with smaller tracts in marginal climates devoted to oats, barley, rye and the millets. The first steps toward civilization itself began with the cultivation of grasses whose seeds had previously been gathered wild. Where conditions are unsuitable for cultivation, livestock subsists on natural grazing, while in more mesic areas planted pastures of cultivars bred for high forage value allow a carrying capacity higher than that of the natural rangeland.

There are about 770 genera and 9 700 species of grasses in the world (Watson & Dallwitz 1989) and the Poaceae is thus the fifth largest plant family in number of species, ranking behind Asteraceae, Fabaceae, Orchidaceae and Rubiaceae. In southern Africa, the grasses include 194 genera and 967 species and infraspecific taxa, of which 115 are naturalized and 847 are indigenous, with 329 endemics. In the southern African flora, grasses rank second (to Asteraceae) in the number of genera and seventh (after Aizoaceae, Asteraceae, Fabaceae, Liliaceae (*s.l.*), Iridaceae and Ericaceae) in the number of species (Gibbs Russell 1985).

Objectives of this book

This book has two objectives. The primary purpose is to provide a means for identifying southern African grasses to genus and species, and to give a core of basic information about each taxon. Identification aids at the genus level include keys, descriptions, line drawings and spikelet photographs; species level identification aids include keys, distribution maps and brief contrasting descriptions. The text is supported by a computer treatment that provides more complete data sets that can be used for interactive identification and information retrieval. A secondary objective of the project is to serve as a prototype for the computerization of descriptive data in the PRECIS computer system and to assess its utility in transferring information about plants from taxonomic specialists to practical users (Gibbs Russell & Arnold 1989). This book should therefore be regarded as the next logical extension of the treatment of the Poaceae in the *List of species of southern African plants*, edn 2 (Gibbs Russell *et al.* 1985).

Potential users of an identification manual for grasses range from school pupils and farmers to specialists in grass taxonomy. We have attempted to aim the book somewhere in the middle: to those with a basic background in the biological sciences. However, so that the book may serve a wider range of people we have included the many drawings and spikelet photographs as well as an illustrated glossary of specialized terms. The Introduction summarizes important aspects of grass structure and relationships and is intended for those with little access to the extensive specialist literature on these subjects.

It must be emphasized very strongly that this book represents a state-of-the-art account of our grasses in 1989; a definitive treatment will require much more research into the basic biological behaviour and taxonomic relationships of our species. Throughout the book we have pointed out particular problems where further study is needed, and we hope that these comments will be a stimulus to more research on the grasses of southern Africa.

Grasses included in this book

All grasses that are indigenous in southern Africa, plus those that are naturalized and form self-sustaining populations under local conditions, are covered in the book. It is probable that other naturalized species may occur which have not yet been collected.

Grasses that grow in southern Africa only under cultivation are not included. Grasses are cultivated for pastures, lawns, garden ornamentals, erosion control and especially for crops. Grain crops brought to southern Africa from other continents include maize (*Zea mays* L.) from central America, wheat (*Triticum aestivum* L.) from Europe, the Mediterranean area and western Asia, barley (*Hordeum vulgare* L.) from north temperate regions, oats (*Avena sativa* L.) from temperate parts of the Old World, rye (*Secale cereale* L.) from northern Eurasia and rice (*Oryza sativa* L.) from tropical Asia. Of all our grain crops, only the millets (*Pennisetum glaucum* (L.) R. Br. and *Sorghum bicolor* (L.) Moench, which continues to hybridize with its wild relatives) were brought into cultivation in Africa. It is noteworthy that species widely grown for pastures (e.g. *Digitaria eriantha*, *Lolium temulentum*), lawns (e.g. *Cynodon dactylon*, *Pennisetum clandestinum*), ornamentals (e.g. *Cortaderia selloana*, *Pennisetum villosum*) and erosion control (e.g. *Ammophila arenaria*, *Ehrharta villosa*) are either indigenous or have become naturalized. In contrast, the crop species cannot live successfully out of cultivation (with the exception of *Avena sativa*, which belongs to a genus with many weed species).

Relationships, evolution and ecology

Grasses have the herbaceous stems, sheathing leaf bases and vestiges of the 3-merous flowers common to most monocotyledons. Although grasses were previously classified with the sedges and rushes, which are similar vegetatively and also have highly modified 'chaffy' inflorescences (Cronquist 1981), it is now thought that these resemblances are superficial only. More recent classifications indicate that the nearest relatives of the grasses are probably to be found in the tropical families Flagellariaceae and Joinvilleaceae and the southern hemisphere family Restionaceae (Takhtajan 1969, Campbell & Kellogg 1987, Linder 1987).

The available fossil record of grasses provides little direct information about grass evolution, so our knowledge must be deduced by comparing living forms and is therefore inevitably speculative. The earliest fossils are floret fragments from the Oligocene of North America and leaf cuticles from the Oligocene and Eocene of Germany

(Thomasson 1987). Indirect evidence of the rise in dominance of the grasses and the formation of grasslands comes from the change in dentition of the grazing animals. Herbivore fossils of Eocene age first showed development of high-crowned teeth capable of chewing grass plants, which are abrasive because of silica bodies in the epidermis (Stebbins 1981). There is evidence that by the Oligocene grassland was an established vegetation type, with at least one genus, *Stipa*, that is still in existence (Clayton 1981).

In their co-evolution with animals, the herbaceous habit and intercalary meristems have made it possible for grasses to thrive while being eaten, and they lack many of the various secondary chemical compounds repellent to herbivores that are found in many other plant families. In common with other wind-pollinated groups, grass flower structure is much reduced, and there is often an increase in male flowers over female-fertile flowers. There has thus been none of the co-evolution with animal pollinators that seems to have been so important in other plant groups, which has there resulted in dramatic floral modifications and chemical compounds that attract pollinators by shape, colour, and scent. The pollen grains themselves are uniform in surface structure throughout the grasses and it is not possible even to distinguish the subfamilies (Watson & Bell 1975). This is another contrast to many other plant families, where pollen surface structures are often diagnostic for genera and even species. However, recent photographic studies show that the highly modified bracts (glumes, lemmas and paleas) making up the grass florets and spikelets are precisely oriented to channel the air currents and facilitate the capture of wind-borne pollen by the stigmas (Niklas 1985a, 1985b).

The grasses apparently began to diversify before continents became separated by wide oceans. The subfamilies and tribes are rather uniformly distributed across the continents in broad climatic bands, but the genera, which are of more recent origin, tend to be restricted to a single continent (Clayton 1983). It is interesting to speculate that the initial split between Laurasia and Gondwanaland may be reflected in the grasses by the distinction between the Pooideae, which have diversified greatly in the northern hemisphere, and other subfamilies, which have their greatest diversity in the tropics (Bambusoideae, Panicoideae, Chloridoideae) and in the Gondwanaland continents (many Arundinoideae).

How has a plant family whose members exhibit such a remarkably uniform appearance been able to adapt with great success to an extraordinarily wide range of climates and habitats, and to the changes brought about by man? Evidently, aspects of their characteristic vegetative structure confer on the grasses an advantage over other plant types, yet their apparent uniformity masks significant physiological and cytogenetic variation. The enormous success of the grasses may be based on the following factors:

1. Herbaceous stems and leaves.

Most grasses are herbaceous. They flourish during favourable periods of the year, completing their annual growth and reproduction while the weather is warm and wet, and dying back in cold or dry seasons. Perennials negotiate unfavourable periods as dormant rootstocks or rhizomes, and annuals survive as seeds. In southern Africa, a trend can be seen in many genera where perennial species occur in mesic areas, and annuals occur in the dry west (*Heteropogon contortus* / *H. melanocarpus*, *Setima galpinii* / *S. ischaemoides*), or where some species behave as perennials in more mesic areas and as annuals in arid areas (*Fingerhuthia africana*, *Centropodia glauca*). Even in relatively mesic areas it has been found that a grass plant grows actively only during the most favourable days immediately following rain (Danckwerts 1988).

2. Growing points at the bases of internodes and leaves.

'Intercalary meristems' are a particularly significant adaptation to grazing and to fire. In most plants, the growing points are confined to the tips of stems and

branches. In grasses, besides the usual apical meristem at the shoot tips, additional growing points are located near the base of each internode and at the base of each leaf. (Pull off a grass stem and chew it: the soft, juicy parts are at the bottom of each internode.) In both culm internodes and leaves, cell division and elongation and tissue maturation take place acropetally; that is, the youngest cells are located towards the base and the older towards the tip. Thus, the culm and the leaves grow from below rather than at the tips, so that growth is relatively protected from injury or defoliation by grazing animals or by fire because the actively growing part of the plant is usually not removed. The leaf sheaths are an important adjunct to the intercalary meristem of the culms. The sheaths protect the immature culm tissues, help support the weight of the shoot above, shield the apical meristem that will produce the inflorescence, and overlapping layers of sheaths near the base of the plant act as a 'splint' over the weaker meristematic portions of each node.

3. Plant architecture.

The appearance of the leaves is fairly uniform throughout the family, except for the bamboos. The relatively few species with broad flat horizontal leaf blades occur in forests where the light intensity is low (*Panicum laticomum*, *Oplismenus hirtellus*). In contrast, the more numerous species of the open veld nearly all have long narrow vertical leaves that are supposedly most efficient in strong light (*Eragrostis curvula*, *Cymbopogon plurinodis*). This leaf configuration makes the best possible use of sunlight by allowing light to penetrate deep inside the leaf canopy of the whole plant. Light therefore reaches a relatively large total area of leaf surface, and grasses are thus able to produce a large biomass per volume of space occupied (Newton & Blackman 1970, Lonsdale & Watkinson 1983).

4. Leaf structure, photosynthetic pathway and climatic adaptation.

Although most grass leaves look superficially similar, their anatomy varies considerably and major suites of anatomical characters are associated with differences in the location and biochemistry of photosynthetic processes (Fig. 1). In the most widespread form of photosynthesis in higher plants, primary assimilation of CO₂ from the atmosphere as well as photosynthetic reduction of carbon both occur in all the chlorophyll-bearing cells of the leaf mesophyll. This is called the C₃ pathway, because the molecules of CO₂ are initially fixed as three-carbon chains. It occurs universally in the grass subfamilies Bambusoideae and Pooideae, in many Panicoideae and in most genera of Arundinoideae (*Merxmuellera*, *Pentaschistis*).

The other principal form of higher plant photosynthesis takes place by the C₄ pathway, in which the CO₂ is fixed initially into four-carbon chains. Here, there is a division of labour in the leaf tissues, with the mesophyll cells (PCA tissue) restricted to primary carbon assimilation from atmospheric CO₂, and subsequent photosynthetic carbon reduction confined to specialised cells (PCR tissue) which usually ensheath the vascular bundles. C₄ photosynthesis occurs sporadically in many plant families, including Chenopodiaceae, Euphorbiaceae, Asteraceae and Cyperaceae (*i.e.* in both monocots and dicots), as well as in Poaceae. Among the grasses, C₄ photosynthesis is concentrated in the subfamilies Chloridoideae and Panicoideae. The Chloridoideae are almost exclusively C₄, the only known exception being *Eragrostis walterii* (Ellis 1984). Among the Panicoideae, the supertribe Andropogonodae seems to be exclusively C₄, while the Panicoideae include large suites of genera that are exclusively C₃ (*Oplismenus*, *Sacciolepis*) or C₄ (*Brachiaria*, *Setaria*), a few genera in which both C₃ and C₄ species occur (*Panicum*, *Alloteropsis*), a few truly indeterminate species, and even species (*Alloteropsis semialata*, *Panicum ecklonii*) which include both C₃ and C₄ forms. Most of the genera of Arundinoideae are C₃, but some of the largest are exclusively C₄, notably *Aristida* and *Stipagrostis*. (A less common variant of photo-

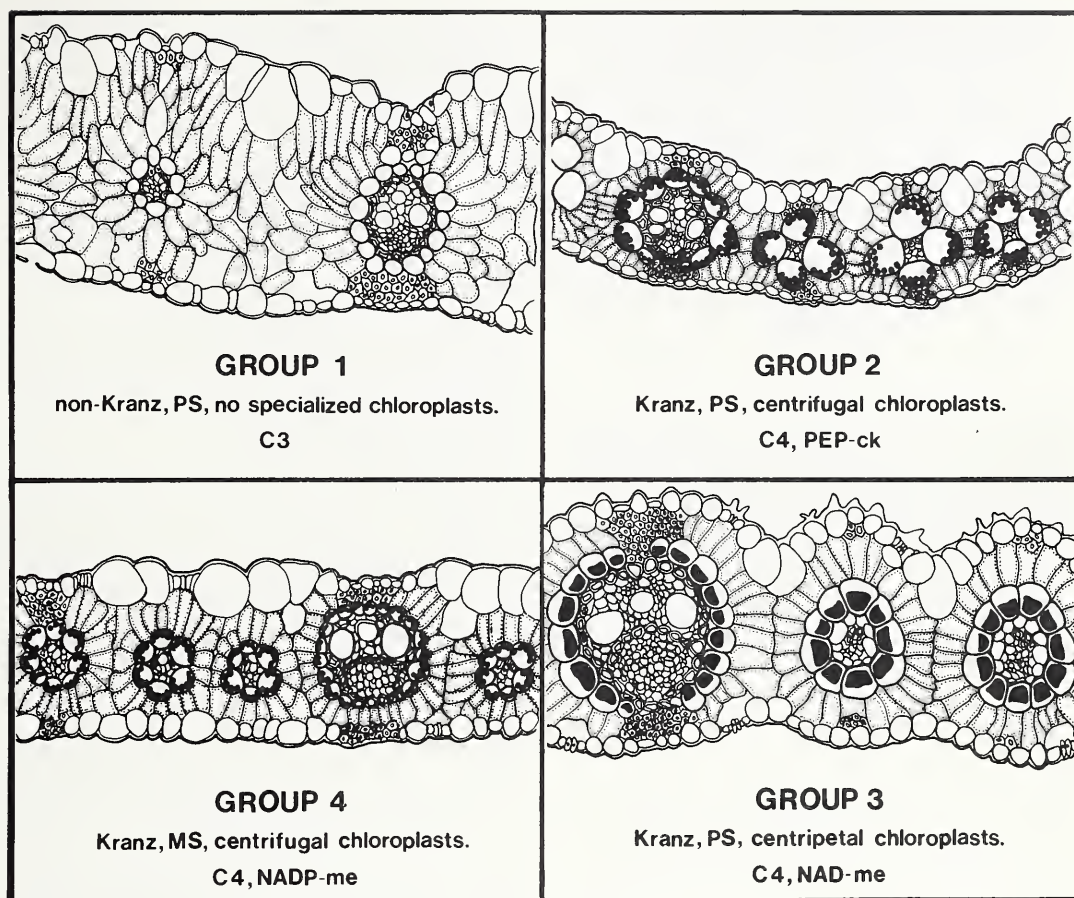


Fig. 1. Transverse sections of leaf blades in *Panicum*, showing the different anatomical types associated with the C₃ and C₄ photosynthetic pathways (R.P. Ellis 1988).

synthesis, termed *crassulacean acid metabolism* (CAM), occurs in a wide range of succulent plants but has not been found in grasses.)

C₄ photosynthesis is experimentally shown to be more efficient than the C₃ version at higher temperatures and higher light intensities (Bjorkman 1976). These differences are broadly reflected in world and local geographical distributions and ecological ranges of grass subfamilies, genera and species. Thus, of the two exclusively C₃ subfamilies, the Pooideae reach maximum diversity in the temperate zone, especially in the northern hemisphere, with major representation elsewhere only at high altitude and in moist habitats, and the Bambusoideae, though mostly tropical, are mainly confined to humid forest shade. The two major C₄ subfamilies, Chloridoideae and Panicoideae, on the other hand, are concentrated in the tropics and subtropics – the former in drier or saline habitats (see below), whereas the latter is extensively mesic, with the C₃ representatives often being aquatic or shade plants. The Arundinoideae, with large C₃ and C₄ genera, are widespread: they are particularly diversified in the temperate southern hemisphere, but the C₄ genera are concentrated in warm regions (Hartley 1958a, 1958b, 1973, Hartley & Slater 1960).

A C₄ grass leaf blade when seen in transverse section will usually exhibit a rather characteristic appearance, known as 'Kranz anatomy'. The specialized PCR tissue here occurs around each main vascular bundle as a single, conspicuous sheath of generally starch-rich cells with abundant chloroplasts; the intervening PCA mesophyll cells commonly exhibit a degree of radiateness about the indiv-

idual bundles; and an inner sheath of smaller cells (the 'mestome sheath') is only sometimes present. C₃ leaves, by contrast, are non-Kranz: the inner, mestome sheath is always present, the outer bundle sheath cells lack or are deficient in chloroplasts and starch, and the mesophyll is usually not noticeably radiate. The Kranz/non-Kranz distinction is rather imprecise, however, and some grasses (including the common genera *Aristida* and *Arundinella*) have leaf blade tissue arrangements where its application is ambiguous or impossible. The only universally applicable, unambiguous and reliable method of anatomical assignment to C₃ or C₄ relies upon counting the number of cells separating chlorenchymatous mesophyll cells from the nearest PCR cell. In the C₃ leaf blade the mesophyll always has some (often many) chlorenchymatous cells separated from the nearest PCR sheath cell by two or more (often many more) comparable cells. In a C₄ leaf blade, by contrast, no chlorenchymatous mesophyll cell is separated by more than one other similar cell from the nearest PCR cell (synonymous with the nearest bundle sheath cell in all African grass genera except some Arundinelleae, which may exhibit conspicuous PCR strands in isolation from the vascular bundles).

Grasses exhibit three biochemical variants of the C₄ pathway, which are less precisely associated with certain anatomical and ultrastructural features. Those exhibiting NADP-ME type C₄ photosynthesis, called 'malate formers', tend to predominate in all regions where C₄ grasses occur, but they reach their maximum abundance in mesic areas. This photosynthetic type most often occurs among the C₄ Panicoideae, of which the supertribe Andropogonodae

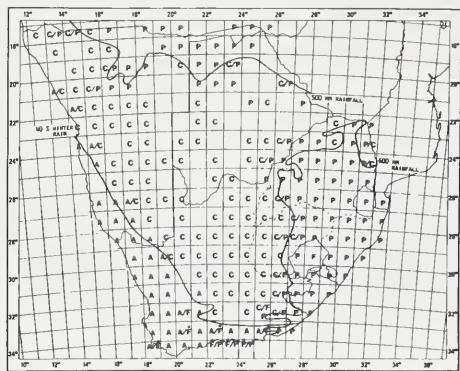


Fig. 2. Grass subfamily regions in southern Africa. The symbol in each whole degree square denotes the subfamily with the largest number of species recorded in Specimen-PRECIS: A = Arundinoideae (including *Ehrharta*); C = Chloridoideae; F = Pooideae; P = Panicoideae. Panicoideae are most abundant in summer rainfall areas with more than 500 mm of rainfall per year; chloridoideae are most abundant in summer rainfall with less than 500 mm of rainfall per year; arundinoids are most abundant in areas with more than 40 % of rainfall occurring in winter; indigenous pooideae are most abundant in the high Drakensberg and introduced pooideae share abundance with arundinoids in winter rainfall areas (Gibbs Russell 1988).

seems to be exclusively NADP-ME. The 'aspartate formers' (NAD-ME and PCK photosynthetic types), on the other hand, reach their maximum diversity in relatively arid regions. This photosynthetic type is concentrated in the Chloridoideae, where the NADP-ME type is unknown, but is also represented in the Paniceae. The ecological association breaks down in the C_4 Arundinoideae, however, since all the representatives whose photosynthetic type is so far known have proved to be NADP-ME, notwithstanding their importance in dry regions (*Aristida* and the Australian *Eriachne*).

The idea that differentiation into C_4 types is fundamentally an expression of climatic adaptation has now been further undermined, with the discovery that many species had been mis-typed as PCK by erroneous predictions of biochemistry from anatomy. Thus the genus *Eragrostis*, which had been thought to include both NAD-ME and PCK species (with the latter species occupying habitats intermediate between those typical of NAD-ME and NADP-ME forms), now seems to be exclusively NAD-ME. Extending biochemical typing (e.g. to cover *Stipagrostis*) will clarify the picture, but it is already clear that taxonomic groupings and certain features of leaf anatomy loosely associated with C_4 types are better indicators of ecological adaptation than are the C_4 types themselves. The important structural features include: presence (XyMS+) or absence (XyMS-) of mestome sheath cells between the large metaxylem elements and the PCR sheath cells of primary vascular bundles; even-versus-uneven outlines of PCR sheaths; presence or absence of a suberised lamella in the PCR cell walls; and location (centripetal or centrifugal/peripheral) of PCR cell chloroplasts (for detailed information, see Hattersley 1987 and Prendergast & Hattersley 1987).

Comparisons between occurrence of subfamilies and major climatic regions have been made both on a worldwide scale (Hartley 1958a, 1958b, 1973, Hartley & Slater 1960) and in southern Africa (Vogel *et al.* 1978, Ellis *et al.* 1980, Gibbs Russell 1988). Fig. 2 shows the subfamily dominant in each whole-degree latitude / longitude square in southern Africa. In general, the three largest subfamilies each dominate in the region where their characteristic photosynthetic pathway is most efficient. This fundamental difference in the veld was first noted by Acocks (1953). The panicoid region corresponds roughly to Acocks' 'red grass'

area, and the chloroid and C_4 arundinoid region corresponds to his 'white grass' areas of southern Africa.

Habitats are not sharply divided between the subfamily regions, and there is a mixture of subfamilies and photosynthetic pathways over large areas. Chloroid grasses can grow in dry microhabitats in mesic areas (*Microchloa caffra*, *Trichonerua grandiglumis*), and pooide grasses in wet places in the desert (*Polypogon monspeliensis*). Some panicoids are adapted to arid areas and are widespread and abundant there (*Cenchrus ciliaris*). In the Fynbos of the winter rainfall areas in the Cape, the grasses form a smaller component of the vegetation than in summer rainfall regions, their place being generally taken by Restionaceae. The naturally occurring Fynbos grasses include many endemic arundinoids (*Pentastichis*, *Pentameris*, *Merxmüllera*, etc.) and bambusoids (*Ehrharta*) that rarely extend to regions outside the Fynbos. The cool wet winters suit pooideae, and there are many naturalized genera, especially from the Mediterranean area (*Avena*, *Hainardia*) which has a climate similar to the southwestern Cape (Gibbs Russell 1988, Linder 1989).

5. Hybridization, polyploidy and asexually produced seeds.

Natural hybridization is common in grasses, and variability is much increased in populations where hybrids occur. This high level of genetic variability probably allows grasses to take advantage of new habitats as they become available (Ehrendorfer 1980). Hybrids are often nearly sterile because of chromosomal incompatibilities and because chromosomes may be present in multiple sets (polyploidy) or be 'unmatched' (aneuploidy). This near-sterility is advantageous in a variant well adapted to a stable habitat because eliminating the sexual process stops gene exchange and thus preserves favourable characteristics. However, it is essential that sterility must not eliminate production and dispersal of seeds. Sterile hybrids commonly set seed through the process of apomixis, in which the ovules develop without fertilization into seeds which carry the same genes as the parent. In this way, a favourable variant can be perpetuated for many 'generations' and the adaptations for seed dispersal in the species can continue to operate. Furthermore, the sterility resulting from hybridization and polyploidy is not absolute. There is always a low incidence of sexual reproduction that maintains variability. If the environment changes or if a new habitat becomes available it is likely that yet another form will be well adapted to the new situation.

There is good reason to suppose that this ability to hybridize and to exploit the advantages of hybrid species complexes with ranges of chromosome numbers and genomes is ancient in the grasses. The phenomenon occurs in all subfamilies and is common in many genera – as many as 80 % of grass species are of polyploid origin (De Wet 1987). In southern Africa, small genera are often represented by a widespread, extremely variable species (*Themeda triandra*, *Heteropogon contortus*). Some larger genera have a number of well-demarcated species with distinct, restricted distributions, which exist alongside a widespread species that hybridizes with some of them and blurs the species boundaries (*Hyparrhenia hirta*, *Digitaria eriantha*, *Eragrostis curvula*, *Ehrharta calycina*, *Pentastichis pallida*).

Classification and nomenclature

Biological classifications cannot be static: they must change as new data and new interpretations result in new opinions about the relationships of organisms, and in response to the changing needs of users. The family Poaceae has undergone several stages of reclassification, as information from several disciplines has been added to that from the basic morphology. Grasses have most recently been classified into five major subfamilies: Arundinoideae,

	No. genera	No. species
Pooideae	40	133
Bambusoideae	10	48
Arundinoideae	22	210
Chloridoideae	50	232
Panicoideae	72	334
Total	194	957

Table 1. Number of genera and species (plus infraspecific taxa) per subfamily in southern Africa.

Bambusoideae, Chloridoideae, Panicoideae, Pooideae, (Watson *et al.* 1985) with a sixth smaller subfamily, Centothecoideae, sometimes segregated from the Bambusoideae (Clayton & Renvoize 1986). Table 1 shows the number of genera and species in each subfamily. A complete classification of the southern African genera, with descriptions of the subfamilies, supertribes and tribes appears on p. 381, and a synopsis of the classification is given on p. 29.

In the last century, spikelet structure was the main basis for higher classification of grasses (Bentham 1883, Hackel 1896). A few grass treatments still in use (e.g. Hitchcock & Chase 1950, Chippindall 1955) follow this classification, which recognizes two main subfamilies: panicoids vs. the rest (*i.e.* Panicoideae and Festucoideae). However, even before 1900 it was evident that a classification based on spikelet characters alone contained artificial groups, because spikelets of similar appearance occur in more than one lineage as a result of parallel evolution. In the 1930s leaf anatomy, cytology and physiology (Aydlow 1931) were correlated with spikelet structure, and since the 1950s a number of new classification systems have been published, based on a wider range of characters including spikelet structure, leaf blade anatomy, starch grain structure, cytology, embryo structure, and photosynthetic physiology (Prat 1960, Stebbins & Crampton 1961, Jacques-Felix 1962, Watson *et al.* 1985, Clayton & Renvoize 1986, Tzvelev 1987). However, systematic knowledge of the 'cryptic' characters is far from complete, and they are unrecorded for many genera (Watson 1987). This lack of basic data introduces an element of uncertainty into even the most recent subfamily classifications.

Furthermore, although reasonable agreement has been reached on classification at subfamily level, at least for a core group of genera in each subfamily, satisfactory classification of species into genera remains the greatest challenge for grass taxonomists. Limits between closely related genera are not settled, for example between *Eragrostis* and *Stiburus*, *Ehrharta* and *Microlaena*, *Cenchrus* and *Pennisetum*. A number of 'satellite' genera have recently been united with a larger genus, for example *Pseudobromus* with *Festuca*, *Poagrostis* with *Pentastachys*, *Beckeropsis* with *Pennisetum*, *Cymbosetaria* with *Setaria*, *Rhynchelytrum* with *Melinis*, as well as *Hypogynium* and *Dictyonis* with *Andropogon*, (thus decreasing the number of genera counted for southern Africa). There are several major problems of generic delimitation which reflect the need for further taxonomic studies on a world scale, for example among the Paniceae involving *Panicum*, *Bracharia*, *Pseudobrachiaria*, *Leucophrys*, and *Urochloa* and among the Danthonieae involving *Merxmuellera*, *Karroochloa*, *Poagrostis*, *Pentastachys*, *Rytidosperma* and *Danthonia*. Unfortunately, the classification of species into genera often remains contentious, not always through lack of sufficient taxonomic research, but because there is plenty of room for different generic interpretations even when there is agreement on the essential facts. It may seem that satellite genera are regularly described, submerged, resurrected, etc., according to personal preferences and current fashions.

The classification system is related to nomenclature at the level of genus. When a genus is reclassified, the names of its species may change. For example, *Rhynchelytrum* and *Melinis* have recently been classified in the same genus (Zizka 1988). The *International Code of Botanical Nomenclature* prescribes that the older name must be used for the combined genus, so all species formerly classified in *Rhynchelytrum* must be transferred to the older name *Melinis*. Occasionally a genus name must change because an older name is found in the literature even though it has not been used for many years, for example, the older name *Tripsolium* had to replace *Lasiochloa*. The same principles of nomenclature apply at species level also, so that species names too change as a result of reclassification ('lumping' previously separate species, or 'splitting' a species into two) according to the rule of priority.

The grass plant

Grasses may be tufted and erect, creeping and rhizomatous or stoloniferous, floating, climbing, scrambling or even arborescent. However, these different forms are all constructed in a modular fashion from repeating units. The basic construction unit of a grass plant is called a phytomer, and consists of an internode with its associated node, leaf, bud and (sometimes) an adventitious root (Clark & Fisher 1987). All parts of the grass plant, excluding only the tiny flowers hidden in the spikelets, may be considered to be constructed of phytomers. Fig. 3 illustrates a grass plant with its parts labelled.

Roots

Grass roots are fibrous, with little modification, and usually penetrate less than 1 meter into the soil (Troughton 1957). Each plant has two root systems. Seminal roots arise from the germinating embryo, and are very soon replaced by the nodal root system that arises from the culms. Individual nodal roots may last one to several years (Clark & Fisher 1987). Some grasses have stout prop roots arising at lower nodes on erect culms above the soil surface (*Zea mays*, *Hyparrhenia tamba*); others have decumbent culms that root at the lower nodes (*Enneapogon desvauxii*, *Cenchrus ciliaris*); and still others have roots arising from nodes of the stolons or rhizomes (*Pennisetum clandestinum*, *Cynodon dactylon*).

The root hairs of grasses are often long and persistent, in contrast to most other plants in which they are short-lived (Metcalfe 1960). Grasses from arid areas (*Brachiaria serrata*, *Stipagrostis ciliata*) often form rhizosheaths, protective and absorptive casings around the roots composed of root hairs, root cap mucilage, sand grains and micro-organisms. Nitrogen-fixing bacteria can occur in association with these rhizosheaths (Wullstein *et al.* 1957). Mycorrhizal associations on grass roots have been found in Pooideae, Arundinoideae, Chloridoideae and Panicoideae, but not in Bambusoideae (Clark & Fisher 1987).

Stems

Grass stems fall into three general categories, aerial culms, underground rhizomes and stolons that lie at the soil surface. The culms are the most conspicuous part of the grass plant, bearing the leaves and the inflorescence, and their height, branching pattern and posture largely determine its overall appearance. Except in the woody bamboos and a few other forms (*Arundo donax*), the culms are mostly annual even though the plant itself may be perennial. The culms die back every year and the flowering culms die after flowering. However, sometimes the tillers (side-shoots) may behave as biennials and flower the following year.

The culms are jointed and nearly always cylindrical, with elongated internodes connected by short, harder, disc-shaped nodes. The internodes are most commonly hollow, but are solid in many panicoid and chloridoid grasses, or

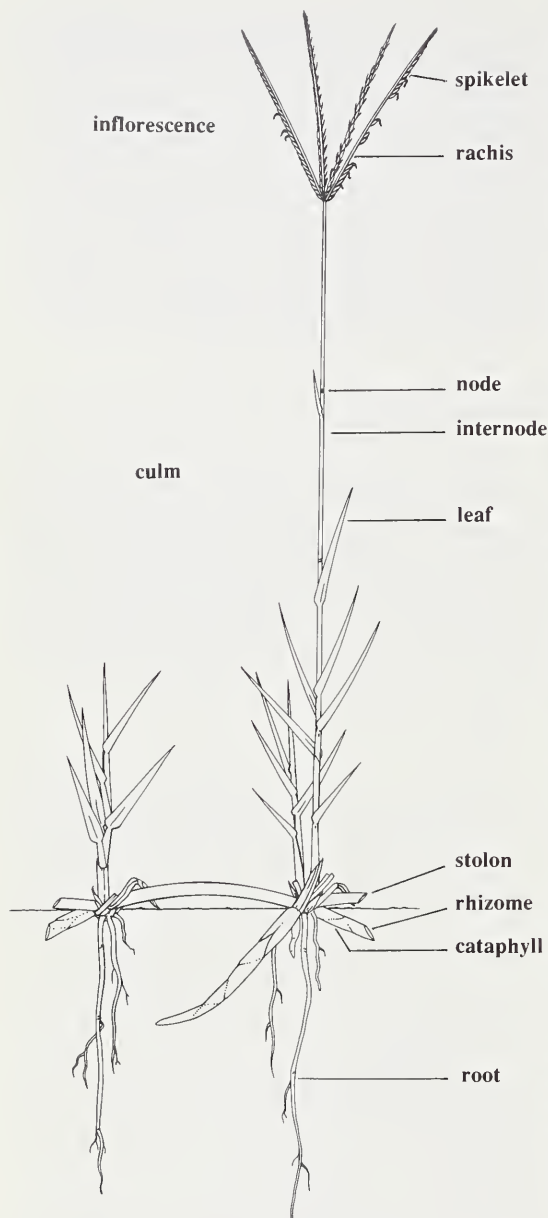


Fig. 3. A common grass species, *Cynodon dactylon*, with its parts labelled.

sometimes become hollow with age (Brown *et al.* 1959). In some grasses the internodes remain short until the inflorescence is developed, when they lengthen rapidly (*Harporchloa falx*), but in others the internodes elongate early (*Phragmites australis*). A few grasses have alternating long and short internodes (*Stenotaphrum secundatum*). As each internode matures, the tissues toward its upper end mature first, leaving an area of undeveloped tissue still capable of cell division at the base, the intercalary meristem. The nodes are the point of origin of the buds and leaves. They are always solid and have a complex vascular organization. Nodes are often quite different in external appearance from internodes, often being wider or narrower and sometimes hairy (*Setaria incrassata*, *Trachypogon spicatus*), or with a conspicuous ring of hairs (*Sorghum halepense*, *Stipagrostis ciliata*), or have a darker colour (*Eragrostis obtusa*, *Sorghum versicolor*).

The location of the main branching system of a species determines not only its appearance but its degree of protection from grazing and fire. Rhizomatous grasses branch below the surface of the soil and are extremely well-protected from fire. Stoloniferous (sward-forming) grasses branch at the soil surface and thrive under grazing. Tufted or tussock grasses, including many widespread veld grasses, branch just above the soil surface. Culms, rhizomes and stolons arise from lateral buds in the leaf axils. Inside the leaf sheath, the bud is enclosed in the prophyll, a scale-like modified leaf with two keels.

The aerial culms may be unbranched (simple) or branched. The culm branches, called tillers, may arise intravaginally (with the new shoot remaining inside the leaf sheath and emerging from the top) or extravaginally (with the new shoot rupturing the base of the leaf sheath). Worldwide, intravaginal branching is more common than extravaginal branching, and in southern Africa extravaginal branching is rare. Intravaginal branching may give the tillers extra protection from the periodic burns usual in our area. Valuable pasture grasses produce much herbage, and are usually freely tillering or branching above the base (*Schmidtia pappophoroides*, *Cenchrus ciliaris*).

The posture of the culms is usually typical for a species (Fig. 4), and varies from erect (*Miscanthus capensis*, *Cymbopogon plurinodis*) through geniculate and bent at the nodes (*Digitaria sanguinalis*, *Eragrostis lehmanniana*), or decumbent with the lower part of the culm on the ground and the upper part erect (*Digitaria debilis*, *Brachiaria marlothii*) to procumbent and lying flat on the ground (*Urochloa panicoides*) or even scrambling on other plants (*Prosphytochloa prehensilis*, *Olyra latifolia*).

Rhizomes are underground stems with scale leaves and roots at the nodes. True roots are easily distinguished because they have no nodes or scale-leaves. The buds of rhizomes may develop into erect leafy shoots, into stolons or into secondary rhizomes, and their proliferation may result in complicated rhizome systems (*Imperata cylindrica*, *Sorghum halepense*). Stolons are above-ground, horizontal stems that produce roots, leaves, and flowering shoots at their nodes (*Monelytrum luederitzianum*, some forms of *Digitaria eriantha*). Although they are usually easy to distinguish, rhizomes and stolons may occasionally intergrade (*Cynodon dactylon*). Many species of the open veld have short stout rhizomes and knotty culm bases, these structures together being loosely designated the 'rootstock' (*Andropogon ravus*, *Aristida junciformis*) (Gould 1968).

Rhizomes, stolons and culm tillers all are important in vegetative reproduction. Culms and roots produced from the nodes of rhizomes and stolons soon become independent plants if the parent structures are severed. Anyone who has planted a lawn from 'runners' (rhizomes and stolons) knows how easily new plants can grow from the old stems. Even in erect species that lack rhizomes or stolons, the aerial culm tillers can be important in vegetative reproduction. A vigorous plant produces new tillers toward the

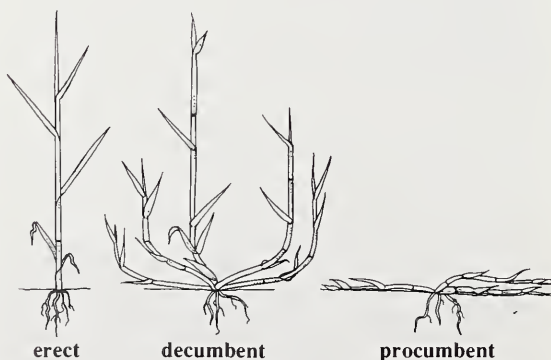


Fig. 4. Typical culm positions.

outside. As the diameter of the tuft becomes larger the centre dies out and the plant assumes a ring-like appearance. Continued growth outward can result in fragmentation into separate individuals. In England, plants derived from an original clone of *Festuca ovina*, with an estimated age of 1 000 years had spread over 200 meters (Harberd 1961, 1962).

At the base of the internode in many non-poooid grasses is a swollen area, the pulvinus, which by differential growth can change the orientation of the internode above. The pulvinus is sensitive to gravity, and when a culm is blown down the cells on the lower side, stimulated by hormonal changes, elongate and cause the pulvinus to bend upward, thereby re-orienting the culm to its normal position (Clark & Fisher 1987). Pulvini also occur at the base of inflorescence branches and cause the inflorescence to open out quickly when the stamens and stigmas are mature. Occurrence of internodal pulvini is a feature of potential taxonomic interest (Dayanandan *et al.* 1977) which merits further study.

Leaves

Grass leaves consist of three parts (Fig. 5), the sheath which envelops the culm, the blade which extends from it, and the collar and ligule located at the junction of sheath and blade. Blade and sheath are the main sites of photosynthesis in a grass plant. Leaves are nearly always initiated alternately on opposite sides of the apical meristem, and are therefore initially 2-ranked (in contrast to the vegetatively similar sedge family, Cyperaceae, which commonly has 3-ranked leaves). The leaves may be basal or cauline. Some species have only basal leaves (*Microchloa caffra*, *Cortaderia selloana*), others have only culm leaves (*Pseudopentameris brachyphylla*, *Trichopteryx dregeana*) and probably most have both basal and culm leaves (*Cymbopogon excavatus*). The uppermost culm leaf below an inflorescence is often somewhat different in form and is commonly called the flag leaf. Leaves, like internodes, also have intercalary meristems and increase in length from growing points near the base. This is especially advantageous because growth continues unimpeded by grazing at the leaf tips.

The sheaths overlap when the culm is young, and form an integral part of its support structure. Usually the sheath margins are rolled together around the culm and not joined, but in a few genera the sheath margins are fused and the sheaths are therefore tubular for much of their length (*Melica*, *Bromus*). The sheaths at the bottom of the culm are called basal sheaths, and may be variously modified. They may be persistent (*Sporobolus nebulosus*, *Ehrharta dura*), sometimes becoming split into fibres (*Styppeiochloa gynoglossa*, *Festuca costata*), or forming a thick bulbous base around the culm (*Alloteropsis semialata* subsp. *semialata*). When the basal sheaths are strongly keeled, the base of the plant has a flat, fanlike appearance (*Eustachys paspaloides*, *Heteropogon contortus*). Sometimes basal and/or upper culm leaves have reduced blades or consist of bladeless sheaths (*Ehrharta ramosa*, *Stipagrostis geminifolia*).

The ligule is located on the inner (adaxial) side of the leaf at the point where the sheath becomes the blade. This unique structure is without homology in other plant families (Philipson 1935). The ligule may be either a membrane (*Bromus catharticus*, *Hyparrhenia hirta*), a membrane fringed with hairs (*Cynodon dactylon*, *Digitaria tricholaenoides*) or a line of hairs (*Eustachys paspaloides*, *Fingertia africana*), with all gradations between these states. Occasionally the ligule may be absent or present only on the lower leaves (*Echinochloa*). Variations in ligule form are very useful taxonomically, for example, any grass leaf with a ligule consisting of hairs or hair-fringed is almost certainly non-poooid. The ligule type is generally constant in a genus, though in the large genus *Panicum* it may be membranous, hairy or missing. Poooid grasses usually have pale, translucent ligules (*Puccinellia*, *Helictotrichon*), while the ligule in panicoid grasses is usually firm, papery,

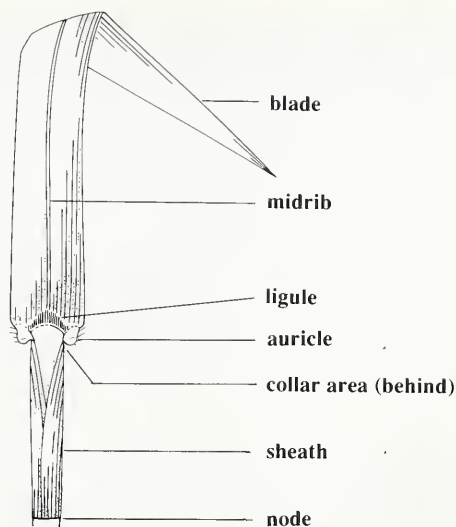


Fig. 5. Parts of a generalized grass leaf.

dry, and/or brownish (*Digitaria*, *Cymbopogon*). The function of the ligule is not clear, but it presumably obstructs the entry of water, insects and bacteria (Tsvelev 1983).

The 'collar' is the area on the outer (abaxial) side of the leaf opposite the ligule. It is often thickened, and is sometimes darker in colour than the rest of the leaf. Infrequently there is a line of hairs (*Alloteropsis semialata*, *Karoochloa curva*) or flap of tissue on the collar which is called the contraligule or abaxial ligule. Also there may be an abscission zone in the collar, the blade being shed while the sheath remains on the plant (*Arundo donax*, *Phragmites australis*, *Ehrharta rupestris*). Auricles are small appendages in the collar area. They may arise from the sheath mouth (*Hordeum murinum*), from the sides of the collar (*Pentameris thurii*), or from the base of the blade (*Ehrharta microlaena*).

Leaf blades are generally long and narrow, and this shape is significant to the productivity of grass plants, as mentioned above. Species with short broad blades tend to be annuals or to occur in habitats such as forests or watersides. The lamina may be constricted near the blade base (*Sorghastrum stipoides*), or even be absent entirely, the blade consisting of the midrib only (*Miscanthus junceus*). The prominence of the veins is variable. Many grass leaf blades have uniformly developed nerves, but broad-leaved non-poooid species usually have a strong midrib (*Zea mays*, *Sorghum halepense*). Forest grasses often have inconspicuous, short transverse veins connecting the longitudinal veins (*Olyra latifolia*, *Megastachya mucronata*). The base of the blade, where it joins the collar, may be straight (*Cymbopogon plurinodis*), rounded (*Perotis patens*), auriculate (*Cymbopogon excavatus*, *Diheteropogon amplexans*), sagittate (*Setaria appendiculata*), or pseudopetiolate (*Setaria sagittifolia*, *Thamnocalamus tessellatus*). The margins may be thickened and undulate (*Brachiaria serrata*, *Ehrharta capensis*), or ciliate with stiff hairs (*Sporobolus nitens*). The tips may be rounded (*Chloris pycnothrix*, *Paspalidium obtusifolium*), hooded (*Heteropogon contortus*), attenuate (*Phragmites australis*) or pungent (*Phragmites mauritanus*, *Cladoraphis spinosa*).

Many grass leaf blades inroll or infold in response to water stress, and such reactions presumably restrict water loss from the stomata of their upper surfaces. Inrolling can be involute from both margins (*Diplachne fusca*) or convolute from one side, with one margin wrapped round the other (*Leersia hexandra*). Simple folding along the midrib is quite common (*Themeda triandra*, *Heteropogon*

contortus), and sometimes the blades may be plicate and folded accordion-fashion (*Setaria megaphylla*). However, in many species with the 'underside' (abaxial epidermis) permanently exposed, this surface has at least as many stomata as the protected upper surface. Search of the computerized descriptive data associated with this book yielded a list of only 31 southern African genera with species lacking (or with very few) abaxial stomata, and twelve of these genera apparently consist exclusively of such species (e.g. *Ammophila*, *Merxmüllera*, *Odontelytrum*, *Oxyrhachis*, *Pentameris*, *Sphenopus*, *Styppeiochloa*). Experiments could be devised to investigate whether these species are particularly efficient in controlling water loss through inrolling or infolding. This is an example of the wide opportunities the computerized data provides for further pursuit of this and many other aspects of morphological and anatomical structure/function relationships, and for generating testable hypotheses.

White or brown scale leaves (cataphylls) occur on the rhizomes and stolons and reduced bladeless sheaths may occur at the plant base or on the culms. However, the most obvious reduced leaves are the several kinds of bracts that occur in the inflorescence. Flowers with their subtending bracts form the florets and spikelets that comprise the basic units of the grass inflorescence. A pair of bracts (glumes) lies at the base of each spikelet, and another pair of bracts subtends each flower. The lower of these is the lemma, and the upper is the palea, which is thought to be homologous with a prophyll because of its commonly 2-keeled structure (Clifford 1987). In addition, genera with much-branched inflorescences, particularly in the tribe Andropogoneae, often have reduced leaves called spathes and spatheoles below the inflorescence branches and raceme clusters (*Mono-cymbium cerasiiforme*, *Themeda triandra*).

Leaf blade anatomy and its importance in classification and identification

In preparing the printed keys and descriptions for this book, we have assumed that most users will lack the equipment and/or the inclination to become involved in anatomy. However, unlike flowers and fruits, leaf blades are available on most plants most of the time. Furthermore, certain materials requiring identification, e.g. fossils and digestive tract contents, consist predominantly of leaf fragments. Clearly, there is every incentive to develop techniques and expertise to use the wealth of anatomical information available, and computer-aided identification makes identification of sterile and fragmentary specimens increasingly possible. Nobody with a serious interest in practising grass taxonomy (as opposed to merely using some of its results) can hope to do so effectively without anatomical understanding, and without access to a suitable compound microscope.

The conventional distinction between 'morphology' and 'anatomy' is quite arbitrary, and by extending their data gathering activities into anatomy, and thence into ultrastructure, physiology and biochemistry, taxonomists greatly improve the standard of their classificatory work, while extending the possibilities for identification into new dimensions. This principle is true for all plant groups, but it has been applied more widely and to greater effect in the grasses than elsewhere. Organized acquisition of comparative data on grass leaf blade anatomy commenced in earnest in the first third of this century, and gradually accelerated as the data came to be viewed alongside information from other fields and as the taxonomic implications were understood. The most spectacular result was a revolution in grass classification, the need for which was apparent by the 1950s but which has only recently been comprehensively implemented. The extent to which anatomical and related physiological considerations are now part of grass taxonomy is apparent in the group descriptions provided with modern classifications, and is reflected in the summarized descriptions in the section on classification (p. 381).

The automated database from which the generic descriptions in this book are derived carries comparative information on about 80 leaf blade anatomical characters, about half of them requiring a transverse section and half observable in the abaxial epidermis. Many of the characters are of great identificatory reliability at generic or higher group level. Such characters of the transverse section include the various features indicative of the C₃ and C₄ photosynthetic pathways, as well as those more loosely associated with the various C₄ types. Important characters of the epidermis include presence or absence and forms of microhairs and papillae, arrangements of short cells and shapes of silica-bodies.

Illustrations of salient anatomical characters are available in several sources: Watson & Dallwitz (1988), which is cross-referenced with the character list accompanying the automated world generic database, Metcalfe (1960), and Clifford and Watson (1977). The continuing series of papers by Ellis (quoted in Ellis 1987) contain superb leaf anatomical illustrations of southern African grasses.

Scanning electron microscopy is easy to apply in studying surface features, and may be the only practicable approach to dealing with some kinds of fossil material. However, light microscopy generally yields more information about the epidermis than does SEM, and most of the accumulated data, both in the literature and in the database, against which comparisons can be made, were obtained from light microscopy.

Leaf blade epidermal preparations and sections should be taken from the mid-laminar region, avoiding diseased material, flag leaves, first seedling leaves and others which seem likely to be 'atypical'. Dried material can be boiled for a few minutes in water with a wetting agent (such as a detergent). *Epidermis* should be taken from the underside (abaxial surface) of the blade. It can be prepared by peeling or by scraping away the tissues from the other side. *Sections* can be cut using a razor blade or a sharp hollow-ground razor, with the leaf blade supported in carrot, pickled elder pith or expanded polystyrene. Many of the most useful anatomical features can be satisfactorily observed in unstained sections and pieces of epidermis, mounted in water, at magnifications between x 25 and x 400. Indeed, such features as chloroplast distribution are reliably interpreted only in this way, and it is recommended that all preparations from living material should first be examined unstained. Phloroglucinol plus concentrated hydrochloric acid provides a simple and rapid temporary stain. It is particularly useful for an inexperienced observer because the lignified cells walls are stained bright red and provide a valuable guide to tissue identification and section orientation, and the acid renders thick sections more transparent. Permanent preparations of both epidermis and sections are conveniently and very effectively stained in phenolic Bismarck brown, which is particularly useful in picking out the detailed shapes of silica bodies. Stain for 10–20 minutes, wash in distilled water, dehydrate in the usual way through a sequence of alcohols ending in absolute, clear in xylene (avoid inhaling the vapour!), then mount in Depex or Canada Balsam. Bismarck brown can be made from the following recipe: 1 g Bismarck brown; 5 g phenol crystals; 100 ml distilled water. Mix and leave to stand for 1 hour (keeps indefinitely).

Inflorescences

The inflorescence is the part of the plant that bears flowers, and like the vegetative component it is conveniently seen as constructed of phytomers (an internode plus its associated node, bud and leaf), although in some inflorescence parts the leaves and buds are suppressed. The inflorescence terminates the culm, and it matures from the apex down (basipetally); that is, the older spikelets will be found toward the tip of the inflorescence and the younger spikelets toward its base.

In most plant families the basic unit for classifying inflorescences is the flower, but in grasses the basic unit is the spikelet. Grass inflorescences vary greatly in general form, size and shape, and the terminology applied to them is difficult because the terms are not precisely defined and because there may be continuous variation between designated 'inflorescence types'. Unfortunately, a satisfactory terminology has yet to be devised and generally applied. In this treatment the following groupings are used (Fig. 6). They are reasonably unambiguous, and most inflorescences are readily referable to one or other of them.

Spike: a single unbranched central axis with the spikelets sessile upon it (*Lolium temulentum*, *Oropetium capense*).

Spike-like main branches borne on a central axis: the branches may be narrow spikes, racemes, or panicles. The main branches may arise digitately or subdigitately at the apex of the culm (*Cynodon dactylon*, *Digitaria eriantha*) or they may be spaced along the main axis (*Urochloa mosambicensis*, *Bothriochloa bladhii*, *Brachiaria serrata*). The part of the axis, or branch, from which the spikelets arise is known as the rachis, and the basal part of the branch below the spikelets is sometimes called the peduncle.

False spike: with spikelet clusters borne sessile or subsessile upon the unbranched central axis (*Setaria sphacelata*, *Pennisetum sphacelatum*). Each spikelet cluster is actually borne on a branch system with very short internodes.

Raceme: a single unbranched central axis bearing pedicellate spikelets (*Urelytrum agropyroides*, *Heteropogon contortus*).

Panicate: the main axis giving rise to branches which bear the spikelets (*Eragrostis curvula*, *Panicum natalense*). Panicles are the most common inflorescence type in the grasses. In some cases the panicle may be very narrow, with erect and appressed branches, so that it appears spike-like (*Imperata cylindrica*, *Fingerhuthia africana*).

A complex of 'partial inflorescences' and intervening foliar organs: in a number of genera in the Andropogoneae, the basic inflorescence unit terminating each culm branch is a raceme or cluster of racemes. However, because the culms are (profusely) branched above, the whole upper part of the plant becomes a 'false panicle' or compound panicle (*Hyparrhenia*, *Cymbopogon*).

The spikelets usually occur singly, but in Andropogoneae they are nearly always paired, with one spikelet of each pair sessile or short-pedicellate and female-fertile, the

other long-pedicellate and often male or sterile. Spikelet pairs are also found in some Paniceae (e.g. *Digitaria*) but both spikelets of the pair are similar and hermaphrodite. Triads of spikelets occur in some panicoids (*Tristachya*) as well as in a few pooids (*Hordeum*), and triads often terminate the racemes in Andropogoneae (*Chrysopogon serrulatus*).

Genera in different tribes often have inflorescences that are quite similar in appearance. For example, *Cynodon* (Chlorideae), *Digitaria* (Paniceae), *Dichanthium* (Andropogoneae) all have digitately arranged, spike-like main branches. Inflorescence type is therefore a poor character for classification, but it is a good character for identification because it is such a striking feature of the grass plant. This is why, despite the drawbacks of imperfect terminology and lack of classificatory significance, inflorescence type features prominently in the keys to genera in this book.

Spikelets

The spikelet consists of the rachilla, or central axis, which bears distichous glumes at the base and florets above. Each floret consists of a pair of bracts, the lemma and palea, which conceal a single delicate flower. Although grass spikelets vary greatly in their outward appearance, there is a remarkable constancy of structure (Fig. 7). Rachillas, glumes, lemmas and paleas are usually readily identifiable in spikelets though they exhibit many (sometimes spectacular) modifications.

Spikelet differences provided the main characters for classification of grasses into genera, tribes and subfamilies until about 60 years ago (Avdulov 1931). Even though there has been considerable reclassification of grasses at the subfamily level based on anatomy, physiology and cytogenetics, spikelet differences are still the most convenient characters to use in identifying genera and species. In order to make a positive identification it is usually necessary to examine spikelets with at least 10 x magnification. In this treatment, the underlying computerized data affords the possibility of making identifications to genera using vegetative and anatomical characters, but observation of spikelet characters is still necessary to use the printed keys to genera and species.

Four spikelet differences are particularly important for identification:

1. **Plane of flattening.** A laterally flattened spikelet lies on its side when tossed on a flat surface, while a dorsiventrally flattened spikelet lies on its 'back' or 'front' (abaxial or adaxial surface). Generally, chloridoid (*Eragrostis superba*) and pooid (*Bromus catharticus*) grasses have laterally flattened spikelets whereas panicoid grasses (*Hyparrhenia hirta*, *Panicum maximum*) have dorsiventrally flattened spikelets. Some genera (*Aristida*, *Stipagrostis*) have nearly cylindrical spikelets.

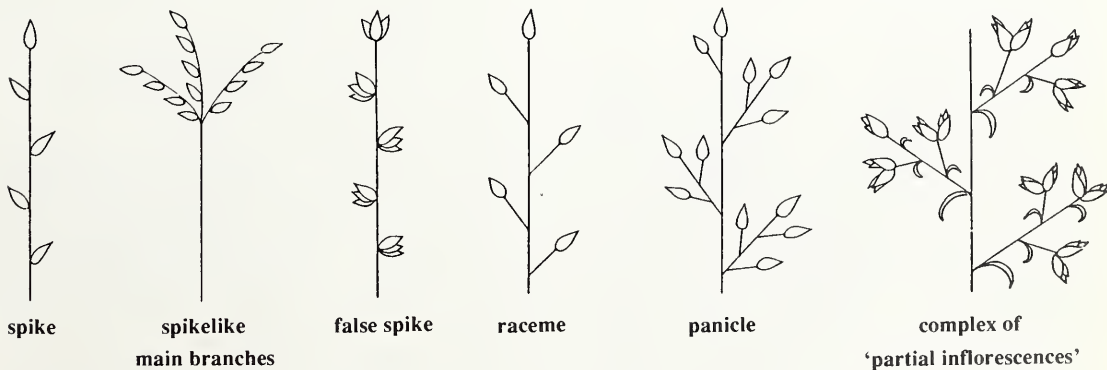


Fig. 6. Diagrams of grass inflorescence types.

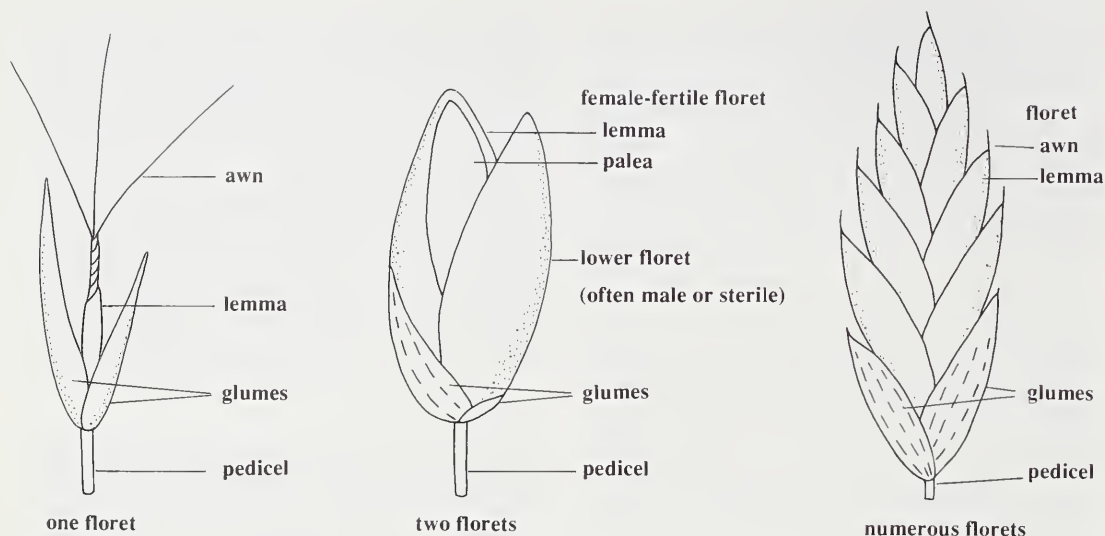


Fig. 7. Comparative diagrams of generalized grass spikelets.

2. *Number of florets.* Some genera have only a single floret in each spikelet (*Sporobolus*, *Agrostis*). There are always two florets per spikelet in the great subfamily Panicoideae (*Panicum*, *Andropogon*) and there are a larger number of florets in other subfamilies, up to about 15 in *Megastachya* and over 50 in *Eragrostis*.

3. *Disarticulation.* The mature spikelet may separate from the plant below the glumes (*Heteropogon*, *Polygogon*), above the glumes (*Chloris*, *Bromus*) or between each of the florets (*Helictotrichon*), and in some species of *Eragrostis* the lemma disarticulates separately, leaving the palea behind on the rachis. In genera where the spikelets are aggregated, the whole cluster sometimes disarticulates, sometimes together with the associated bristles (*Antherophora*, *Pennisetum*, *Cenchrus*). The place where the spikelet disarticulates at maturity is of great importance in seed dispersal because this determines which accessory structures (paleas, lemmas, rachilla segments, glumes, pedicels) accompany the seed when it is shed from the parent plant.

4. *Sexuality of the spikelets and their florets* is less easy to observe than the others. In the grass family there seems to be a general evolutionary trend towards increase in number of male spikelets and comparative reduction in number of the female-fertile florets. Male or sterile spikelets are generally smaller in size with reduced bracts, while the female-fertile spikelets tend to be larger and have more elaborately specialized bracts. These differences appear to be biologically sound in a wind-pollinated family: there are more pollen-producing male flowers and a variety of seed-dispersal mechanisms associated with the female flowers.

A few grasses are dioecious, with separate male and female plants having spikelets and florets of a single sex (*Cortaderia jubata*, *Festuca scabra*) and a few others have spikelets of a single sex borne in different inflorescences (in *Zea mays* the tassel has only male spikelets and the cob has only female-fertile spikelets). The majority of grasses, however, have spikelets of different sexes within the same inflorescence (*Olyra latifolia*) or florets of different sexuality within the same spikelet (*Panicum deustum*, *Melica racemosa*). In the tribe Andropogoneae (*Hemarthria*, *Andropogon*, *Themeda*, *Hyparrhenia*, *Heteropogon*, etc.) both conditions exist together: the pedicellate spikelets are usually male or sterile and the sessile spikelets have two florets, the lower male or sterile and the upper female-

fertile. Thus in the sessile-and-pedicellate spikelet pair which comprises a seed dispersal unit, there is only one female-fertile floret, this being the upper floret of the sessile spikelet.

The location of the vestigial, sterile or male-only florets in a spikelet is important in both classification and identification. They are always at the base of the spikelet (proximal) in the panicoid grasses (*Panicum*, *Andropogon*, etc.) and are usually at the apex of the spikelet (distal) in the genera of other subfamilies (*Enneapogon*, *Eustachys*, *Festuca*), with some exceptions (*Ehrharta*, *Phalaris*). Some genera may have both proximal and distal sterile or male florets (*Phragmites*, *Eutoplocamia*). The reduced florets may be variously modified for seed dispersal, with awns (*Holcus*, *Ehrharta*) or hairs (*Melica*).

Spikelets have three kinds of bracts: glumes, lemmas and paleas. Glumes and lemmas have been likened to modified leaf sheaths. Both, but more commonly the lemmas, may bear awns, which can be envisaged as modified leaf blades. There are usually a pair of glumes at the base of the spikelet, and they may be distinguished from lemmas because they are empty, that is they enclose no palea or flower (Clifford 1987). Sometimes one (*Lolium multiflorum*, *Eriochloa stapfiana*) or both (*Oryza longistaminata*) glumes may be missing. The size and thickness of the glumes relative to the lemmas are important characters. The glumes may be longer than the rest of the spikelet (*Avena*, *Hemarthria*, *Merxmüllera disticha*) or much shorter even than the adjacent lemmas (*Eragrostis*, *Cynodon*). The glumes may be firmer than the lemmas (*Themeda*, *Heteropogon*) or the lemmas may be firmer than the glumes (*Panicum*, *Digitaria*).

Lemmas are always present. They are more diverse throughout the family than are the glumes, but are generally very similar within a genus. The shape, texture, and number of veins of the lemmas, and the presence, type, number and location of their awns vary greatly and are therefore taxonomically important. Very hard lemmas that persistently clasp the mature fruit are common in the Paniceae. These hard lemmas often have an area of weakness on the back, the germination flap, which opens when the root of the germinating embryo emerges from the enclosed seed (*Brachiaria*, *Digitaria*, *Loudetia*).

The palea may be envisaged as a modified prophyll and lies with its back against the rachilla (Clifford 1987). It is almost always smaller than the lemma and its margins are

usually hidden inside the lemma except when the floret opens to expose the mature stamens and stigmas. In contrast to the glumes and lemmas, which commonly have an odd number of nerves and are 1-keeled, the palea is usually 2-nerved and 2-keeled. The lemma and palea together enclose the much-reduced flower. In many cases they continue to enclose the mature fruit, and are often modified to aid its dispersal. In genera where the glumes are relatively large and thick (*Rottboellia*, *Cymbopogon*) the lemma may be much reduced and the palea vestigial or absent. Conversely, where the glumes are absent the palea is exposed and thickened (*Leersia hexandra*, *Oryza longistaminata*), although the interpretation of organs in oryzoid spikelets is debatable).

Flowers

The grass flower is composed of lodicules, stamens and a pistil (Fig. 8). The lodicules are small organs that lie between the lemma and the stamens. They swell when the flower is mature and force apart the lemma and palea, allowing the anthers and stigmas to emerge. After anthesis the lodicules lose turgidity and the lemma and palea close again around the developing fruit. There are commonly two lodicules, but some genera may have one (*Melica*) or three (*Olyra*, *Thamnocalamus*). The derivation of lodicules is controversial. They have in the past been considered a modified perianth but the evidence is not conclusive, and a recent interpretation considers them to be organs peculiar to the grasses (Clifford 1987).

Most grasses have three stamens, but there may be one (sometimes in *Imperata cylindrica*), two (*Diandrochloa namaquensis*), four (*Microlaena stipoides*) or six (*Oryza longistaminata*, *Ehrharta erecta*). The bamboo *Ochlandra* of India, Ceylon and Madagascar may have as many as 120 stamens. Stamen number tends to be reduced in cleistogamous spikelets (*Bothriochloa insculpta*). Anther length varies from about 0.1 to 14 mm and is often a convenient character to separate species. Anthers are usually small in the chloroid grasses, and anther size tends to be reduced in cleistogamous florets. Pollen surface morphology is remarkably constant throughout the family, and the genera or even the subfamilies cannot be distinguished on pollen surface characteristics (Watson & Bell 1975). However, subfamilies and tribes are distinguishable in terms of pollen antigens and allergens – an example of how taxonomy can exchange information with other disciplines to mutual advantage (Watson & Knox 1976).

The pistil terminates the flower, and has a single locule containing one ovule. The ovary is generally barrel-shaped or fusiform and is usually glabrous. However, there is sometimes a tuft of hairs at its apex (*Festuca*, *Bromus*, and *Pentameris*). There are usually two styles, which are normally separate but may be fused at the base (*Elymandra*, *Entoplocamia*). In a few cases the stigmas too are fused

(*Zea mays* has a single fused stigma up to 75 mm long, the longest known for flowering plants (Clifford 1987)). The stigmatic hairs vary in colour from white to purple-black, and the colour may change as the stigma ages.

Pollination

All grasses are wind pollinated, except for a few forest-floor genera that do not occur in southern Africa. Grass pollen tends to retain its viability only over short distances. However, it can travel enormous distances; as hayfever sufferers are uncomfortably aware, grass pollen may travel many kilometers from stands of heavy pollen-producing species, retaining its allergenic properties (Gregory 1973, Knox 1979). The daily period of flowering and pollination is fixed within narrow time limits for each species, which presumably increases the chances of pollination. Closely related species may be reproductively isolated by flowering at different times of the day (Tsvelev 1983). In short-distance wind pollinated species outbreeding may be maintained by complex incompatibility mechanisms in the stigma and style (Heslop-Harrison & Heslop-Harrison 1987). Few studies of flowering biology, however, have been carried out for even the most economically important southern African species.

In cleistogamous spikelets the lemma and palea do not open and self-fertilization occurs within the closed floret. Cleistogamy is not often reported for southern African grasses. Pits on the lower glumes in *Bothriochloa* may restrain stamen emergence (Heslop-Harrison 1961), and *Enneapogon desvauxii* has cleistogamous spikelets in the leaf sheaths as well as ordinary (chasmogamous) inflorescences. In *Pennisetum clandestinum* the spikelets are all hidden in the leaf sheaths, but they are not cleistogamous because the stamens and stigmas are exposed.

Fruits, seeds and embryos

The grass grain, or caryopsis, consists of one seed closely surrounded by the pericarp, the thin adherent outer layer of the fruit. The caryopsis is the characteristic fruit type of the grasses, and is unique to them. Throughout the family there are a number of variations in the pericarp, which in rare cases may be berry-like, achene-like or nut-like (Sendulsky *et al.* 1987). These variations may be readily interpreted as derived from a caryopsis in which an inner tissue layer collapses at a relatively late stage of development, resulting in a free or readily removable pericarp. For example, especially in the tribe Chlorideae, the pericarp is soft and separable from the seed (e.g. *Eleusine* and *Sporobolus*, in which the pericarp of the wet utricule splits and extrudes the seed). On the adaxial side of the fruit is the hilum, a round (*Eragrostis*, *Panicum*) or elongated (*Ehrharta*, *Stipagrostis*) scar where the seed is attached to the pericarp. Inside the seed, food for the developing embryo is stored in the endosperm and is com-

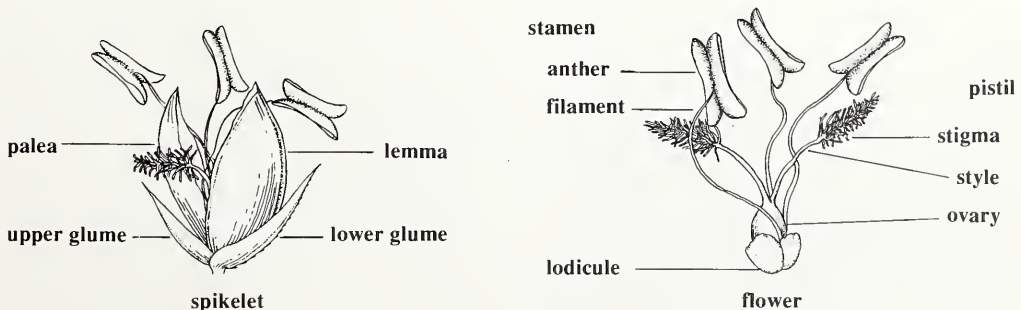


Fig. 8. Parts of a spikelet that has a single floret, and its flower (*Cynodon dactylon*).

posed of starch, oils and proteins. The embryo is small relative to the volume of endosperm, and lies on the opposite side to the hilum. Differences in embryo size and structure tend to characterize subfamilies (see pp. 381–388).

Seed dispersal

Plants are generally sessile, rooted organisms, but relocation occurs twice in their life cycle, at pollination and at seed dispersal. In contrast to the apparently unspecialized wind pollination in grasses, transport of the seed to a favourable place for germination is effected by a remarkable range of strategies. However, in most grasses the seeds and fruits themselves are not modified for dispersal; instead, it is the inflorescence bracts and branches that show an array of adaptations involving transport by wind and water, by other organisms, (in fur, skin, feathers, clothing and digestive tracts), and even by self-propulsion. Parallel evolution of the many different kinds of dispersal mechanisms in various subfamilies and tribes has been a conspicuous feature in the evolution of the large number of grass genera and species (Davidse 1987). A few genera show no apparent adaptation for seed dispersal, and the caryopsis may be dispersed unaccompanied by accessory structures (*Agrostis*, *Eragrostis*).

The glumes or lemmas occasionally have long hairs which sail the fruit long distances (*Stipagrostis*, *Imperata cylindrica*, *Phragmites australis*). In other adaptations to wind dispersal, the entire inflorescence breaks off and rolls about as a tumbleweed (*Trichonerua grandiglumis*, *Panicum volutans*), or the inflorescence falls together with the flag leaf, which acts as a sail (*Urochlaena pusilla*).

Several aquatic genera have corky inflorescence axes, which break up into short sections each bearing a sessile and a pedicellate spikelet which float to a new location (*Hemarthria altissima*, *Rottboellia cochinchinensis*).

There are many adaptations to dispersal by animals. The bare seed may be extruded from the viscous pericarp and positioned at the spikelet tip where it can adhere to a passing animal (*Sporobolus*). Other mechanisms to disperse fruits by clinging include hooks on the glumes or lemmas (*Tragus racemosus*, *Pseudechinolaena polystachya*); tangles of large scabrous awns from several spikelets (*Heteropogon contortus*); clusters of spikelets with scabrous subtending bristles (*Setaria verticillata*, *Cenchrus*

brownii); and calluses with clinging retrorse hairs that penetrate skin with a pungent tip (*Aristida stipitata*, *Heteropogon contortus*). Note that structures collectively termed calluses represent modifications of different spikelet parts, depending on where the spikelet disarticulates: the base of the lemma (*Vulpia*), the base of the lemma plus part of the rachilla (*Helictotrichon*), the base of the spikelet (*Diheteropogon*) or the base of the spikelet plus part of the pedicel (*Schismus barbatus*, *Polypogon*).

Callus hairs and bent and twisted awns act together in self-propulsion. The callus hairs allow the cylindrical floret or spikelet to move in only one direction, and the twisting of the awn as a result of hygroscopic changes drills the floret or spikelet into the soil (*Pentstemonis*, *Heteropogon*). Fruits dispersed by this mechanism can thus benefit from both animal transport and self-propulsion.

In many Paniceae, the fruit is closely surrounded by glumes, a lower lemma and palea and a hard upper lemma and palea. These protective layers possibly ensure its safe passage through the digestive tracts of animals. Herbivory in this case is part of the dispersal mechanism, and many species with spikelets of this kind have soft, palatable herbage (e.g. in *Panicum*, *Brachiaria*, *Paspalum*). Elaiosomes, oil-containing appendages that mature at the same time as the caryopsis, are another adaptation for dispersal which attract insects with the offer of food. Ants carry the seed underground along with the accessory structure bearing the elaiosome. In *Rottboellia cochinchinensis* the elaiosome is on the 'peg' at the base internode which accompanies the dehiscent spikelet; in *Eriochloa meyeriana* it is a beadlike structure at the base of the spikelet formed from a reduced glume and the adjacent internode; *Ehrharta calycina* has an ear-like appendage at the base of the sterile lemmas that may be an elaiosome.

Finally, one of the most remarkable factors contributing to widespread dispersal of grasses is a consequence of the copious endosperm of the seed. The nutritious grains attracted the attention of hunter-gatherer people, and led to the cultivation and improvement of cereal crops, which has ultimately resulted in today's mechanized agricultural industry based on highly selected hybrid cultivars. Monocultures of cereal crops now extend over vast areas of the earth's surface. These few species have reached continents far from their places of origin, and have replaced naturally occurring plants to an extent that represents an alarming loss of genetic and ecological diversity.

METHODS AND FORMAT

What is unusual about this book?

This volume is unique in several ways. First, it is at this time the only identification manual for a major plant family occurring in a large area to be produced from computerized data. The data is consistently recorded and fully comparative, and automation has been applied at all levels: gathering and recording data, preparing keys and descriptions, plotting distribution maps, and typesetting. Second, the data backing up the book and the programs for manipulations are made freely available on MS-DOS computer diskettes. The generic descriptive data (Watson & Dallwitz 1988, 1989) includes copious information on grass anatomy, biochemistry, physiology, ecology, host/parasite associations, economic aspects, taxonomic relationships, nomenclature, phytogeography, source references, etc. Third, because of this wealth of data at generic level, sterile and fragmentary specimens can often be identified to genus using the program INTKEY. Identification of poor material is impossible in conventional identification manuals which lack this new dimension of access to the underlying automated data. Fourth, any part of the treatment can be easily expanded and updated as more information is recorded and as taxonomic concepts change. Fifth, subsets can be generated from the computerized data to cover smaller areas or specific groups of taxa. These could include additional information present in the generic and species databases but not published in this volume.

The resources to produce this co-ordinated treatment, linking a conventional identification manual with supporting computer programs and full data sets, were fully available at the National Herbarium, Pretoria (PRE). There has been a long history of grass research at the Botanical Research Institute, which has accumulated over 70 000 grass specimens from southern Africa, and holds important collections of illustrations and photographs, rare books essential to nomenclatural study, as well as slides, photographs and voucher specimens for comprehensive anatomical and cytogenetic studies of all southern African grass species. Besides this specialization in grasses, PRE is the most advanced herbarium in the world for computerized coverage of its specimens and of the flora of a major subcontinental region. The PRECIS system holds data for over 650 000 specimens and 24 000 southern African plant taxa (Gibbs Russell & Arnold 1989). For this project we were able to link the southern African grass data at species level in PRECIS with the automated descriptions of grass genera developed at the Taxonomy Laboratory of the Research School of Biological Sciences at the Australian National University (Watson *et al.* 1988, Watson & Dallwitz 1989). Thus all descriptive information has been handled through the DELTA programs produced at the Division of Entomology, CSIRO, Canberra (Dallwitz & Paine 1986). Coupling the data for southern African species with Watson's worldwide generic data has resulted in a package comprising not only traditional-style keys, descriptions and illustrations, but also a flexible system for interactive identification and information retrieval.

We believe that the day is past when solitary taxonomic specialists, working in isolation, produce soon-to-be-outdated monographs and flora contributions. This book and its underlying computerized data clearly demonstrate that a group of scientists with different kinds of expertise working in widespread localities can co-ordinate their efforts by contributing to a single database. The result is a comprehensive taxonomic treatment with greater flexibility

and much wider ranges of applications than would have been possible using traditional methods.

The DELTA computer system

The DELTA computer system that underlies the book is a generalized system for handling all the different kinds of descriptive data used by taxonomists, without information loss, in an easy-to-use format designed to minimize encoding errors (Dallwitz 1980, Dallwitz & Paine 1986, Watson & Milne 1972). DELTA was adopted as the standard format for taxonomic descriptions at the 1988 meeting of the Taxonomic Databases Working Group for Plant Sciences.

An associated program, CONFOR (Dallwitz & Paine 1986), translates the coded descriptions into natural language; produces summarized data for specified sets of taxa, giving for multistate characters the numbers of taxa exhibiting each character state and for numeric characters giving the means, ranges and names of taxa exhibiting the extremes of ranges; and carries out various data maintenance operations, for example changing the sequences of characters and character states while keeping all the files consistent with one another. CONFOR can also translate data coded in DELTA format into formats required by various other taxonomic programs, including KEY (Dallwitz 1974, Dallwitz & Paine 1986) and GENKEY (Payne 1975) for making printed keys; DIST (Dallwitz & Paine, unpublished) for generating distance matrices; and PAUP (Swofford 1984) for phylogenetic analysis. DELTA format is used directly by programs in the PANKEY package for a number of taxonomic applications (Pankhurst 1986, Pankhurst & Aitchison 1975), and also by the program TYPSET for automated typesetting from DELTA data (Dallwitz & Zurcher 1988).

The program INTKEY greatly extends the range of applications of the DELTA format (Watson *et al.* 1989). Besides allowing interactive identification, INTKEY also provides a flexible system for information retrieval. For example, it can be used for generating group descriptions for a specified set of taxa; for determining diagnostic characters for a taxon or group of taxa; and for finding the similarities or differences between taxa. INTKEY output can be read to files as well as to the computer screen, and information can be changed to the format required for other programs.

Availability of computerized data and programs

The interactive data set, comprising the generic descriptions and the species descriptions in INTKEY format together with the program INTKEY, is available free of charge from the Data Officer, National Botanic Gardens / Botanical Research Institute, Private Bag X101, Pretoria 0001, South Africa, or from L. Watson, Research School of Biological Sciences, Australian National University, GPO Box 475, Canberra A.C.T., Australia 2600. The set will be supplied on 360K 5 1/4-inch floppy disks or 740K 3 1/2 inch stiff disks suitable for MS-DOS microcomputers. INTKEY requires at least 512K of memory (RAM). The complete world generic data occupies 710K of disk space and the southern African species data occupies 870K, so a hard disk or large-capacity floppy is required for data manipulation. Special subsets could be provided to users with severe space limitations in their microcomputers.

Generic keys

The keys to genera were prepared from the database of world grass genera maintained in the DELTA system (Watson 1987, Watson *et al.* 1989), using the key-generating program KEY (Dallwitz & Paine 1986). They continue a series of keys produced from the world database for several countries: Australia (Clifford & Watson 1977, Watson & Dallwitz 1980, 1985); Canada (Watson, Aiken *et al.* 1985); and Greece (Watson, Damanakis & Dallwitz 1988).

About 100 characters for vegetative and spikelet morphology were used in the key. These were selected for ease of observation and usefulness in distinguishing southern African grasses, from the *ca.* 480 characters available in the world grass database (p. 389). KEY was run a number of times, with adjustments to character weightings, additional preset characters at desired points and changes in numeric ranges to improve each run over the previous one. The program parameters set to produce each part of the generic key appear on p. 407. The final key was exhaustively checked against southern African specimens and minor changes were incorporated by hand.

A number of genera appear more than once in the key, partly as a result of selecting 'easy' characters, especially for the early choices. The key is therefore longer on the printed page, but is actually shorter to run: the longest track through the key to 194 genera reaches an identification in 17 steps, and most tracks are considerably shorter. 'Backtracking' after an uncertain outcome is possible because at each couplet the previous couplet number is given in parentheses.

We strongly recommend computer-aided identification using the program INTKEY. The advantages of this method include use of distribution data to limit the number of genera to be considered, and access to descriptors for any plant part in any sequence. It is often possible using INTKEY to identify sterile or fragmentary material to genus, which cannot be done through the printed key. (Note that it is perfectly feasible to use the computerized data to generate printed keys to genera using vegetative and anatomical characters.)

The generic keys are not strictly dichotomous. The number of alternative choices in any set reflects the number of states recorded for each character. (See the generic character list on p. 389.) In a few cases the generic key runs directly to a species, where an anomalous species is quite distinct from the others in its genus (*e.g.* *Pentaschistis pusilla*, *Pennisetum unisetum*).

Generic descriptions

The genera appear in alphabetical order so that they can be easily located in the book. A 'taxonomic' sequence was not used because of the uncertain higher classification of some genera, and the fact that better generic classifications will certainly be forthcoming: an attempted 'taxonomic' sequence for the genera would soon be out of date. The most up-to-date classification will be available in the most recent version of the DELTA database. The classification and supposed relationships of the genera accepted in 1989 are given in the section on classification of southern African genera (p. 381), and a synopsis of the subfamilies, tribes and genera with similar genera listed together, appears just after the generic key (p. 29).

The descriptions were prepared from the database using the program CONFOR (Dallwitz & Paine 1986). A core of characters was included for all genera, as well as additional characters important in each subfamily. *The minimum diagnostic characters necessary to distinguish each genus from others in its subfamily are printed in italics*, and were determined by an INTKEY search. These short descriptions, suitable for a manual such as this, present only a small fraction of the information available in the database for each genus.

At the beginning of this project, before generic descriptions and keys were attempted, the database was scanned to find southern African genera with missing data. Much additional morphological information from herbarium specimens was added for about 70 genera, and leaf blade anatomical data was provided from copies of photomicrographs supplied by R.P. Ellis for about 40 genera.

The short list of references for each genus is held in Taxon-PRECIS, and includes recent revisions followed and the sources of synonymy for the species.

Illustrations

At least one illustration is included for each genus and more for large genera, except for four naturalized genera which are not illustrated (*Bambusa*, *Microlaena*, *Paratheria*, *Periballia*). The drawings were prepared by a number of artists over the years. The majority (about 140) have been recently prepared under the supervision of grass specialists, mostly at PRE and WIND, and some (about 70) were first published in Chippindall (1955). The 32 'borrowed' illustrations are acknowledged in the Preface. For three naturalized genera, photocopies of herbarium specimens replace a drawing (*Corynephorus*, *Craspedorhachis*, *Lamarckia*).

Spikelet photographs

There is at least one spikelet photograph for each genus, and all photographs were prepared especially for this book. They were taken with a Wild M400 stereomicroscope connected to a Wild MP545 photo-automat, using the fixed time exposure mode and Ilford FP4 film. Spikelets from herbarium specimens or from fresh plants were mounted on the tip of a beading needle and positioned on a fine-grained grey sandpaper. This provided an out-of-focus, uniform, non-reflecting background. All photographs are grouped together for reasons of economy. It would have been more desirable to place each spikelet photograph with the rest of its generic treatment.

Species keys

The species keys are the only descriptive part of the book not prepared through the DELTA system. They were written by hand because the species data available at this early level of approximation of the species database in Taxon-PRECIS is presently insufficient for key generation (see below). All the species keys are strictly dichotomous, and the previous couplet number is given in parentheses at each couplet to allow 'backtracking'.

Species descriptions

The species appear in alphabetical order but cross-references to related or similar species are provided. The species treatments were produced from computerized data held in DELTA format, but the species database is developed separately from Watson's world generic data, as part of Taxon-PRECIS. The DELTA treatment began by taking over the scientific names, synonyms and references from Taxon-PRECIS Approximation 2 (Gibbs Russell & Arnold 1989). Continuing the PRECIS format, the number after each synonym indicates a source for the synonymy in the references listed for each genus. As mentioned previously, the grass species database is a prototype for adding descriptive data to the Taxon component of PRECIS, to assess the method before extending it to other plant families. The species character list (p. 405) is based on the 'common knowledge' characters included as 'type one data' in the ILDIS legume database (ILDIS

Coordinating Centre 1986), with the addition of diagnostic characters and voucher specimens as recommended by the 1987 meeting of the Herbarium Curators Working Group.

The species descriptive data was obtained from original observations of specimens at PRE (and other herbaria as necessary) and from literature. It represents the minimum information required to distinguish each species from others in its genus. (This is the reason species treatments in large genera are considerably longer than those in genera with few species). Data for biomes, distribution, and flowering time was extracted from Specimen-PRECIS (Gibbs Russell & Arnold 1989) and verified as each genus was studied. In most genera 'flowering' time represents the spread of months in which spikelets are present on a range of herbarium specimens, but in *Pentaschistis* the time of anthesis was determined by field study. The specialist responsible for the species treatment in each genus is named at the end of the generic description.

Distribution maps

The maps for each species were plotted from specimen records held in Specimen-PRECIS, using the graphics package CA-DISSPLA (Version 9.0) on a Burroughs B7900 mainframe connected to a Hewlett-Packard HP7550A plotter through a Burroughs B28 local area

network. The provincial boundaries in South Africa were added programmatically to the basic 'cylindrically equidistant' map projection produced by DISSPLA.

Each dot on the map represents a record in a quarter degree latitude/longitude grid in Specimen-PRECIS, but the maps were plotted at a half degree scale so that the dots were visible on these small maps. In a few cases the Specimen-PRECIS data was insufficient, and distributions were obtained from other herbaria and specialists (especially in *Pentaschistis* and a number of introduced genera). Quality control was carried out at two levels: specimen identifications were checked and corrected in Specimen-PRECIS as each genus was studied, and when draft maps were plotted records that appeared unusual were checked in the herbarium.

A note on typesetting

Generic keys and generic and species descriptions were printed on a photocopier as camera-ready bromides directly from the DELTA format data through the program TYPSET, which produces ASCII files with embedded instructions for Postscript printers and photocopiers. All other text has been similarly printed using TYPSET on ASCII files produced by *Wordstar Professional 5.0*.

KEYS TO GENERA

Identifying grasses by printed keys is not easy. This book covers 194 genera and 957 species and infraspecific taxa; to distinguish them it is usually necessary to observe details of spikelet structure, which often require magnification. Furthermore, spikelets at a stage suitable for identification exist on the plant for only a short time during the year. Equipment needed to make the observations essential to use these keys includes a 10x lens with a stand (or, better, a dissecting microscope), tweezers with very sharp tips, a dissecting needle, and a ruler accurate to 0.1 mm. The index fingernail is useful to hold down small structures.

The key consists of sets (usually a pair) of one to four contrasting characters that lead to further sets of contrasts, and ultimately to a tentative identification. Each set of contrasts is designated by a number, and the number following in parentheses indicates the previous contrast that led to the present set. In each set of contrasts the characters most easily observed are generally given first, but *it is necessary to attempt to observe all the characters mentioned in each set*. When a tentative identification is reached it must be verified by comparison to illustrations, descriptions or other specimens of known identity. Beginners may find it helpful to take a known plant and run it through the key backward, starting with the identification and working back (using the parenthetical numbers) to gain practice in making the observations and interpreting the choices.

We strongly recommend computer-aided identification using the program INTKEY in place of these printed keys. The advantages of this method include use of distribution data to limit the number of genera to be considered, and access to descriptors for any plant part in any sequence. It is often possible using INTKEY to identify sterile or fragmentary material to genus, which cannot be done through the printed key.

Note that the generic keys are not strictly dichotomous, and in some sets several choices are offered. Up to four contrasting characters may be included in each comparison. These are presented in the order that is assumed to be easiest to see, or to be most important in making the choice. The keys were computer-generated through the DELTA computer system and the program KEY. The method is briefly described on p. 14, and the KEY program parameters are given on p. 407.

Key to Keys

- 1(0). Tall plants, to (2–) 3 m or more in height; culms woody and persistent, always leafy (reeds and bamboos) **Key 1** (p. 17)
Plants seldom reaching 3 m in height; culms herbaceous or uncommonly woody, leafy or not leafy 2
- 2(1). Female-fertile spikelets with proximal incomplete florets or empty lemmas **Key 2** (p. 17)
Female-fertile spikelets without proximal incomplete florets or empty lemmas 3
- 3(2). Inflorescence a single spike (or false spike), a single raceme or composed of spikelike main branches **Key 3** (p. 22)
Inflorescence panicle (occasionally a panicle may be very contracted, with the branches hidden by the spikelets) **Key 4** (p. 25)

Key 1.

- 1(0). Leaves pseudopetiolate 2
Leaves not pseudopetiolate 4
- 2(1). Plants scrambling on forest vegetation; culms less than 10 mm in diameter **Olyra**
Plants not scrambling; culms more than 10 mm in diameter 3
- 3(2). Plants occurring naturally in mountainous areas of Lesotho, Natal and eastern Cape **Thamnocalamus**
Plants escaped from cultivation, mainly in Natal. . . **Bambusa**
Plants cultivated in the Transvaal, near Sibasa . . . **Oxytenanthera**
- 4(1). Female-fertile lemmas conspicuously hairy; ligule hairs to 0.3 mm long, shorter than their subtending membrane **Arundo**
Female-fertile lemmas hairless; ligule hairs longer than 0.5 mm, longer than their subtending membrane **Phragmites**

Key 2.

- 1(0). Plants bisexual, but monoecious, all the fertile spikelets unisexual 2
Plants bisexual with bisexual spikelets 4
- 2(1). Inflorescences in hard, globular, 6–12 mm utricles; female-fertile lemmas with a single median keel on the back **Coix**
Inflorescences not as in *Coix*; female-fertile lemmas rounded, flat or with two or more keels on the back 3
- 3(2). Tall plants to 3 metres or more high; culms woody and persistent; leaves pseudopetiolate, blades wider than 15 mm, with transverse veins readily visible at least abaxially **Olyra**
Plants never reaching 3 metres in height; culms herbaceous; leaves not pseudopetiolate, blades narrower than 15 mm, with transverse veins very inconspicuous **Andropogon festuciformis**
- 4(1). Female-fertile floret 1 per female-fertile spikelet . 5
Female-fertile florets more than 1 per female-fertile spikelet 113
- 5(4). Spikelets with bractiform involucre 6
Spikelets without bractiform involucre, not subtended by scabrid bristles (vestigial branches) 8
Spikelets subtended by several scabrid bristles (vestigial branches) 108
Spikelets (or at least some of them) subtended by solitary scabrid bristles (vestigial branches) . 110
- 6(5). Inflorescence leafy or spatheate, comprising a complex of 'partial inflorescences' and intervening foliar organs; female-fertile lemmas mucronate or awned **Themeda**
Inflorescence not leafy, not spatheate, not comprising 'partial inflorescences' and foliar organs; female-fertile lemmas neither mucronate nor awned . . . 7
- 7(6). Glumes of female-fertile spikelets awned, approximately equalling or longer than the adjacent lemmas; proximal incomplete florets epaleate, sterile **Antheophora**
Glumes of female-fertile spikelets not awned, all shorter than the adjacent lemmas in the intact

- spikelets; proximal incomplete florets paleate (but the palea may be reduced or vestigial), male **Odontelytrum**
- 8(5). Female-fertile spikelets disarticulating above the glumes 9
 Female-fertile spikelets falling with the glumes . 23
 Female-fertile spikelets not disarticulating 105
- 9(8). Female-fertile lemmas with a single median keel on the back 10
 Female-fertile lemmas rounded, flat or with two or more keels on the back 15
- 10(9). Tall plants to 3 metres or more high; culms scandent; leaves clinging by retrorsely scabrid blade margins; grain longitudinally grooved **Prospyrtochloa**
 Plants never reaching 3 metres in height; culms not scandent; leaves not as in *Prospyrtochloa*; grain not grooved 11
- 11(10). Incomplete florets proximal to the female-fertile florets; hilum long-linear; lodicules membranous 12
 Incomplete florets both distal and proximal to the female-fertile florets; hilum short; lodicules fleshy **Ctenium**
- 12(11). Hairy callus present **Microlaena**
 No hairy callus 13
- 13(12). Palea thinner than the lemma **Ehrharta**
 Palea similar in texture to the lemma 14
- 14(13). Leaf auricles present; female-fertile palea back 1-keeled; stamens 5–6 per floret; spikelets very unconventional and hard to interpret . . . **Oryza**
 Leaf auricles absent; female-fertile palea back rounded; stamens 3 per floret; spikelets more or less conventional, with readily identifiable glumes, lemmas and paleas **Phalaris**
- 15(9). Ligule not fringed; embryo less than 1/3 the length of the grain 16
 Ligule fringed; embryo at least 1/3 as long as the grain 17
- 16(15). Panicle contracted; female-fertile lemmas becoming distinctly indurated when mature; palea entire; fresh shoots aromatic **Anthoxanthum**
 Panicle open; female-fertile lemmas not becoming indurated; palea apically notched; fresh shoots not aromatic **Arrhenatherum**
- 17(15). Female-fertile lemmas neither mucronate nor awned 18
 Female-fertile lemmas mucronate or awned 19
- 18(17). Proximal lemmas of the female-fertile spikelets awned, similar in texture to the female-fertile lemmas; female-fertile palea apically notched **Melinis**
 Proximal lemmas of the female-fertile spikelets not awned, less firm than the female-fertile lemmas; female-fertile palea entire **Tricholaena**
- 19(17). Mature female-fertile lemmas with a clear germination flap; stamens 3 per female-fertile floret 20
 No germination flap in the female-fertile lemmas; stamens 2 per female-fertile floret (or 3 in *Loudetia filifolia*, *L. flavida*, *L. pedicellata*) . 22
- 20(19). Callus short; glumes very unequal in the intact female-fertile spikelet; ovary apex glabrous . 21
 Callus long; glumes equal or subequal in length in the intact female-fertile spikelet; ovary apex hairy **Tristachya**
- 21(20). Female-fertile lemmas conspicuously hairy, deeply cleft; palea apically notched, the keels winged; hilum long-linear **Danthoniopsis**
 Female-fertile lemmas not conspicuously hairy, not deeply cleft; palea entire, the keels wingless; hilum short **Arundinella**
- 22(19). Female-fertile lemmas deeply cleft; panicle branchlets capillary; stigmas white **Trichopteryx**
- Female-fertile lemmas not deeply cleft; panicle branchlets not capillary; stigmas golden-brown **Loudetia**
- 23(8). Female-fertile lemmas less firm than the glumes 24
 Female-fertile lemmas and glumes of similar texture 70
 Female-fertile lemmas decidedly firmer than the glumes 80
- 24(23). Female-fertile lemmas neither mucronate nor awned 25
 Female-fertile lemmas mucronate or awned 40
- 25(24). Inflorescence comprising a complex of 'partial inflorescences' and intervening foliar organs 26
 Inflorescence not comprising 'partial inflorescences' and foliar organs 29
- 26(25). Pedicels of the 'pedicellate' spikelets discernable, but fused with the rachis 27
 Pedicels of the 'pedicellate' spikelets free of the rachis 28
- 27(26). Lower glume of female-fertile spikelet globose, lacunose; 'pedicellate' spikelets reduced, herbaceous; lemmas of proximal incomplete florets nerveless **Hackelochloa**
 Lower glume of female-fertile spikelet flattish, not lacunose; 'pedicellate' spikelets similar to the female-fertile spikelets; lemmas of proximal incomplete florets 2-nerved **Hemarthria**
 Lower glume of female-fertile spikelet flattish, not lacunose; 'pedicellate' spikelets reduced, herbaceous; lemmas of proximal incomplete florets 3–4-nerved **Rottboellia**
- 28(26). Hairy callus present; lemmas of proximal incomplete florets decidedly longer than the female-fertile lemmas; articulations of the spikelet-bearing axes distinctly oblique; culms unbranched vegetatively above; female-fertile lemmas nerveless **Elionurus**
 No hairy callus; lemmas of proximal incomplete florets more or less equalling the female-fertile lemmas; articulations of the spikelet-bearing axes more or less transverse; culms branching vegetatively above; female-fertile lemmas 5-nerved **Coelorhachis**
- 29(25). Inflorescence a single spike, with no pedicellate spikelets **Oxyrhachis**
 Inflorescence of spike-like main branches 30
 Inflorescence a single raceme 34
 Inflorescence paniculate 36
- 30(29). Ligule not fringed 31
 Ligule fringed 32
- 31(30). Lower glume of the pedicellate spikelet with an awn 5–10 mm (or longer); articulations of the spikelet-bearing axes distinctly oblique; callus long, hairy; fresh shoots aromatic . . . **Urelytrum**
 Lower glume of the pedicellate spikelet awnless; articulations of the spikelet-bearing axes more or less transverse; callus short, not hairy; fresh shoots not aromatic **Phacelurus**
- 32(30). Inflorescence digitate or subdigitate; glumes very unequal in the intact female-fertile spikelet, lower glume flattened on the back; proximal incomplete florets of the female-fertile spikelets paleate (but the palea may be reduced or vestigial), male **Vossia**
 Inflorescence neither digitate nor subdigitate; glumes equal or subequal in length in the intact female-fertile spikelet, lower glume convex on the back; proximal incomplete florets of the female-fertile spikelets epaleate, sterile 33
- 33(32). Panicle open; spikelet-bearing rachises slender; female-fertile spikelets compressed laterally; lemmas of proximal incomplete florets 2-nerved; culm internodes solid **Vetiveria**
 Panicle contracted; spikelet-bearing rachises

- substantial; female-fertile spikelets compressed dorsiventrally; lemmas of proximal incomplete florets nerveless; culm internodes conspicuously hollow **Eriochrysis**
- 34(29). Articulations of the spikelet-bearing axes more or less transverse; stigmas golden-brown **Rhytachne**
 Articulations of the spikelet-bearing axes distinctly oblique; stigmas pink, red, purple or black . 35
- 35(34). Ligule not fringed; lower glume of the pedicellate spikelet with an awn 5–10 mm (or longer); proximal incomplete florets of the female-fertile spikelets male, the lemmas more or less equalling the female-fertile lemmas; leaf auricles present **Urelytrum**
 Ligule fringed; lower glume of the pedicellate spikelet awnless; proximal incomplete florets of the female-fertile spikelets sterile, the lemmas decidedly longer than the female-fertile lemmas; leaf auricles absent **Elionurus**
- 36(29). Spikelets consistently in long-and-short combinations; glumes equal or subequal in length in the intact female-fertile spikelet 37
 Spikelets not in distinct long-and-short combinations; glumes very unequal in the intact female-fertile spikelet 39
- 37(36). Spikelets in pedicellate/sessile combinations; glumes of female-fertile spikelets very dissimilar in form or texture; styles free to their bases; lodicules present 38
 Spikelets all pedicellate; glumes of female-fertile spikelets more or less similar in form and texture; styles fused basally; lodicules absent **Imperata**
- 38(37). Female-fertile spikelets compressed dorsiventrally; the male and female-fertile spikelets overtly different in form; leaves not distinctly basally aggregated; lodicules ciliate **Sorghum**
 Female-fertile spikelets compressed laterally; the male and female-fertile spikelets externally similar in form; leaves mostly basal; lodicules glabrous **Vetiveria**
- 39(36). Female-fertile lemmas with a single median keel on the back; spikelets 1–2 mm long; fresh shoots aromatic **Melinis macrochaetia, minutiflora, tenuissima**
 Female-fertile lemmas rounded, flat or with two or more keels on the back; spikelets 2–12 mm long; fresh shoots not aromatic **Melinis**
- 40(24). Spikelets of sexually distinct kinds on the same plant — e.g. female or hermaphrodite and sterile or male-only 41
 Spikelets alike in sexuality on the same plant . 66
- 41(40). Female-fertile spikelets compressed laterally . 42
 Female-fertile spikelets not noticeably compressed 47
 Female-fertile spikelets compressed dorsiventrally 52
- 42(41). Proximal incomplete florets of the female-fertile spikelets male, paleate (but the palea may be reduced or vestigial) **Sehima**
 Proximal incomplete florets of the female-fertile spikelets sterile, epaleate 43
- 43(42). Inflorescence digitate or subdigitate . **Arthraxon**
 Inflorescence neither digitate nor subdigitate . 44
- 44(43). The spikelet-bearing units very much reduced, bearing one or a few spikelets . **Chrysopogon**
 The spikelet-bearing units 'racemes' 45
- 45(44). The male and female-fertile spikelets overtly different in form; inflorescence leafy or spatheate; grain compressed dorsiventrally . 46
 The male and female-fertile spikelets externally similar in form; inflorescence not leafy, not spatheate; grain not noticeably compressed **Vetiveria**
- 46(45). Palea lacking within the female-fertile lemma; fresh shoots aromatic **Cymbopogon**
 Palea present within the female-fertile lemma (but may be minute); fresh shoots not aromatic **Andropogon**
- 47(41). Lower glume of female-fertile spikelet distinctly 2-keeled to the middle or below 48
 Lower glume of female-fertile spikelet not distinctly 2-keeled below the upper quarter . 50
- 48(47). Spikelets all pedicellate; female-fertile lemmas entire; callus pointed; inflorescence not leafy, not spatheate; mature spikelet-bearing axes not disarticulating **Trachypogon**
 Spikelets in pedicellate/sessile combinations; female-fertile lemmas incised; callus blunt; inflorescence leafy or spatheate; mature spikelet-bearing axes disarticulating 49
- 49(48). Palea lacking within the female-fertile lemma; fresh shoots aromatic **Cymbopogon**
 Palea present within the female-fertile lemma (but may be minute); fresh shoots not aromatic **Andropogon**
- 50(47). Ligule not fringed; racemes paired; female-fertile lemmas incised, 1-nerved 51
 Ligule fringed; racemes solitary; female-fertile lemmas entire, 3–4-nerved **Heteropogon**
- 51(50). The spikelet-bearing rachises slender; glumes of female-fertile spikelets not awned; lemmas not deeply cleft; panicle branchlets capillary; styles free to their bases **Hyparrhenia**
 The spikelet-bearing rachises substantial; glumes of female-fertile spikelets awned; lemmas deeply cleft; panicle branchlets not capillary; styles fused basally **Elymandra**
- 52(41). Lower glume of female-fertile spikelet distinctly 2-keeled to the middle or below 53
 Lower glume of female-fertile spikelet not distinctly 2-keeled below the upper quarter . 59
- 53(52). Female-fertile lemmas entire 54
 Female-fertile lemmas incised 56
- 54(53). Some spikelet pairs or triplets similar in form (homogamous) **Dichanthium**
 All the spikelet pairs or triplets differing in form (heterogamous) 55
- 55(54). Spikelets in pedicellate/sessile combinations; callus blunt; female-fertile lemmas not conspicuously hairy; pedicels and internodes of the rachis with a longitudinal, translucent furrow; lemmas of proximal incomplete florets nerveless **Bothriochloa**
 Spikelets all pedicellate; callus pointed; female-fertile lemmas conspicuously hairy; pedicels and internodes of the rachis without a longitudinal, translucent furrow; lemmas of proximal incomplete florets 2-nerved . . . **Trachypogon**
- 56(53). Racemes solitary **Schizachyrium**
 Racemes paired 57
 Racemes in groups **Ischaemum**
- 57(56). Fresh shoots aromatic; palea lacking within the female-fertile lemma **Cymbopogon**
 Fresh shoots not aromatic; palea present within the female-fertile lemma (but may be minute) . . 58
- 58(57). Palea 3/4 or more of female-fertile lemma length **Ischaemum**
 Palea conspicuous but less than 3/4 of female-fertile lemma length **Diheteropogon**
 Palea minute **Andropogon**
- 59(52). Proximal incomplete florets of the female-fertile spikelets male, paleate (but the palea may be reduced or vestigial); leaf blades cordate at the base **Thelepogon**
 Proximal incomplete florets of the female-fertile spikelets sterile, epaleate; leaf blades not cordate at the base 60

- 60(59). Female-fertile lemmas entire **Heteropogon**
Female-fertile lemmas incised 61
- 61(60). Inflorescence leafy or spatheate, comprising a complex of 'partial inflorescences' and intervening foliar organs 62
Inflorescence not leafy, not spatheate, not comprising 'partial inflorescences' and foliar organs 65
- 62(61). Racemes paired; some spikelet pairs or triplets similar in form (homogamous) 63
Racemes solitary; all the spikelet pairs or triplets differing in form (heterogamous) **Monocymbium**
- 63(62). Lower glume of female-fertile spikelet convex on the back, upper glume 2–3-nerved 64
Lower glume of female-fertile spikelet sulcate on the back, upper glume 1-nerved **Hyperthelia**
- 64(63). The spikelet-bearing rachises slender; glumes of female-fertile spikelets not awned; panicle branchlets capillary; styles free to their bases; female-fertile lemmas not deeply cleft **Hyparrhenia**
The spikelet-bearing rachises substantial; glumes of female-fertile spikelets awned; panicle branchlets not capillary; styles fused basally; female-fertile lemmas deeply cleft **Elymandra**
- 65(61). Spikelets apparently solitary, each accompanied by a barren pedicel; lodicules glabrous **Sorghastrum**
Spikelets paired, all pedicels spikelet-bearing; lodicules ciliate **Sorghum**
- 66(40). Female-fertile lemmas conspicuously hairy 67
Female-fertile lemmas not conspicuously hairy 68
- 67(66). Perennial; spikelets consistently paired, in long-and-short combinations; lower glume of female-fertile spikelet distinctly 2-keeled to the middle or below; lemmas entire **Miscanthus**
Annual; spikelets solitary, not in distinct long-and-short combinations; lower glume of female-fertile spikelet not distinctly 2-keeled below the upper quarter; lemmas incised **Cleistachne**
- 68(66). The spikelet-bearing rachises slender 69
The spikelet-bearing rachises substantial **Ischaemum**
- 69(68). Articulations of the spikelet-bearing axes more or less transverse **Microstegium**
Articulations of the spikelet-bearing axes distinctly oblique **Eulalia**
- 70(23). Female-fertile lemma margins lying flat and exposed on the palea (*Digitaria*-type) 71
Female-fertile lemma margins tucked in onto the palea (*Paspalum*-type) 76
- 71(70). Ligule not fringed 72
Ligule fringed 73
- 72(71). Proximal lemmas less firm than the female-fertile lemmas; mature lemmas with a clear germination flap; leaves not distinctly basally aggregated; mature spikelet-bearing axes not disarticulating **Digitaria**
Proximal lemmas similar in texture to the female-fertile lemmas; no germination flap in the lemmas; leaves mostly basal; mature spikelet-bearing axes disarticulating **Tarigidia**
- 73(71). Inflorescence of spike-like main branches; spikelets secund, consistently in long-and-short combinations; leaves mostly basal **Alloteropsis**
Inflorescence paniculate; spikelets not secund, not in distinct long-and-short combinations; leaves not distinctly basally aggregated 74
- 74(73). Fresh shoots aromatic; female-fertile lemmas with a single median keel on the back **Melinis**
Fresh shoots not aromatic; female-fertile lemmas rounded, flat or with two or more keels on the back 75
- 75(74). Female-fertile spikelets compressed laterally; lemmas neither mucronate nor awned, 5-nerved, without a germination flap; the palea apically notched **Melinis**
Female-fertile spikelets compressed dorsiventrally; lemmas mucronate or awned, 6–7-nerved, with a clear germination flap when mature; the palea entire **Oryzidium**
- 76(70). Hairy callus present **Oplismenus**
No hairy callus 77
- 77(76). Upper glume of female-fertile spikelet spiny; transverse veins readily visible in the leaf blade at least abaxially; female-fertile spikelets compressed laterally **Pseudechinoalaena**
Upper glume of female-fertile spikelet not spiny; transverse veins very inconspicuous in the blade; female-fertile spikelets compressed dorsiventrally 78
- 78(77). Female-fertile lemmas conspicuously hairy **Entolasia**
Female-fertile lemmas not conspicuously hairy 79
- 79(78). Inflorescence of spike-like main branches **Paspalum**
Inflorescence paniculate **Panicum**
- 80(23). Female-fertile lemmas neither mucronate nor awned 81
Female-fertile lemmas mucronate or awned 102
- 81(80). Female-fertile lemma margins lying flat and exposed on the palea (*Digitaria*-type) 82
Female-fertile lemma margins tucked in onto the palea (*Paspalum*-type) 87
- 82(81). Proximal lemmas of the female-fertile spikelets awned; lodicules absent **Stereochlaena**
Proximal lemmas of the female-fertile spikelets not awned; lodicules present 83
- 83(82). Ligule not fringed 84
Ligule fringed 85
- 84(83). Inflorescence of spike-like main branches; spikelets secund; female-fertile spikelets compressed dorsiventrally; glumes not 1-keeled: rounded, flat or with more than one keel; lemmas rounded, flat or with two or more keels on the back **Digitaria**
Inflorescence paniculate; spikelets not secund; female-fertile spikelets compressed laterally; glumes 1-keeled to middle or below; lemmas with a single median keel on the back **Phalaris**
- 85(83). Spikelets consistently in long-and-short combinations; glumes equal or subequal in length in the intact female-fertile spikelet; lemmas of proximal incomplete florets becoming indurated **Megaloprotachne**
Spikelets not in distinct long-and-short combinations; glumes very unequal in the intact female-fertile spikelet; lemmas of proximal incomplete florets not becoming indurated 86
- 86(85). Female-fertile spikelets not secund, compressed laterally, spikelets not all embedded in the rachis; mature spikelet-bearing axes not disarticulating **Tricholaena**
Female-fertile spikelets secund, compressed dorsiventrally, more or less embedded in the rachis; mature spikelet-bearing axes disarticulating **Stenotaphrum**
- 87(81). Inflorescence of spike-like main branches 88
Inflorescence paniculate 96
- 88(87). Female-fertile spikelets abaxial (with the lower glume on the side away from the rachis or with the upper lemma against the rachis) 89
Female-fertile spikelets adaxial (with the lower glume against the rachis or with the upper lemma on the side away from the rachis) 92
- 89(88). Leaf blades cordate at the base; female-fertile lemmas crested at the tip **Acroceras**

- Leaf blades not cordate at the base; female-fertile lemmas not crested 90
- 90(89). Hairy callus present **Oplismenus**
No hairy callus 91
- 91(90). Glumes and/or sterile lemmas awned or acuminate-mucronate **Echinochloa**
Spikelets awnless, muticous **Paspalum**
Spikelets awnless, the female-fertile lemmas pointed or apiculate but not mucronate **Paspalidium**
- 92(88). Female-fertile spikelets with one glume; all spikelets slightly embedded in the rachis; leaf tips rounded **Axonopus**
Female-fertile spikelets with two glumes; spikelets not embedded in the rachis; leaf tips not rounded 93
- 93(92). Upper glume of female-fertile spikelet spiny; transverse veins readily visible in the leaf blade at least abaxially **Pseudechinolaena**
Upper glume of female-fertile spikelet not spiny; transverse veins very inconspicuous in the blade 94
- 94(93). Female-fertile lemmas conspicuously hairy **Entolasia**
Female-fertile lemmas not conspicuously hairy 95
- 95(94). Female-fertile lemma smooth **Echinochloa**
Female-fertile lemma striate or rugose **Brachiaria**
- 96(87). Glumes of female-fertile spikelets with distinct rows of hairs **Leucophrys**
Glumes of female-fertile spikelets without conspicuous tufts or rows of hairs 97
- 97(96). Upper glume distinctly saccate **Sacciolepis**
Glumes not saccate 98
- 98(97). Female-fertile lemmas crested at the tip **Acroceras**
Female-fertile lemmas not crested 99
- 99(98). Female-fertile spikelets compressed laterally 100
Female-fertile spikelets compressed dorsiventrally 101
- 100(99). Ligule not fringed; glumes equal or subequal in length in the intact female-fertile spikelet; female-fertile lemmas with a single median keel on the back; proximal incomplete florets of the female-fertile spikelets sterile, the lemmas shorter than the female-fertile lemmas **Phalaris**
Ligule fringed; glumes very unequal in the intact female-fertile spikelet; female-fertile lemmas rounded, flat, or with two or more keels on the back; proximal incomplete florets of the female-fertile spikelets male, the lemmas decidedly longer than the female-fertile lemmas **Tricholaena**
- 101(99). Female-fertile lemmas conspicuously hairy; pedicel apices discoid **Entolasia**
Female-fertile lemmas not conspicuously hairy; pedicel apices cupuliform **Panicum**
- 102(80). Inflorescence of spike-like main branches; spikelets secund; lemmas of the proximal incomplete florets less firm than the female-fertile lemmas; female-fertile lemma margins tucked in onto the palea (*Paspalum*-type) 103
Inflorescence paniculate; spikelets not secund; lemmas of the proximal incomplete florets similar in texture to the female-fertile lemmas; female-fertile lemma margins lying flat and exposed on the palea (*Digitaria*-type) **Oryzidium**
- 103(102). Female-fertile spikelets abaxial (with the lower glume on the side away from the rachis or with the upper lemma against the rachis) **Urochloa**
- Female-fertile spikelets adaxial (with the lower glume against the rachis or with the upper lemma on the side away from the rachis) 104
- 104(103). Proximal lemmas more or less equalling the female-fertile lemmas; no beadlike 'callus' supporting the spikelets **Brachiaria**
Proximal lemmas decidedly longer than the female-fertile lemmas; spikelets supported on a hardened beadlike 'callus' **Eriochloa**
- 105(8). Female-fertile spikelets compressed laterally 106
Female-fertile spikelets compressed dorsiventrally 107
- 106(105). Ligule not fringed; female-fertile lemmas with a single median keel on the back; glumes equal or subequal in length; proximal incomplete florets of the female-fertile spikelets sterile, the lemmas shorter than the female-fertile lemmas **Phalaris**
Ligule fringed; female-fertile lemmas rounded, flat or with two or more keels on the back; glumes very unequal; proximal incomplete florets of the female-fertile spikelets male, the lemmas decidedly longer than the female-fertile lemmas **Tricholaena**
- 107(105). Glumes very unequal in the intact female-fertile spikelet; spikelets not in distinct long-and-short combinations; lemmas of the proximal incomplete florets less firm than the female-fertile lemmas; spikelets alike in sexuality on the same plant; female-fertile lemmas entire **Panicum**
Glumes equal or subequal in length in the intact female-fertile spikelet; spikelets consistently in long-and-short combinations; lemmas of the proximal incomplete florets similar in texture to the female-fertile lemmas; spikelets of sexually distinct kinds on the same plant — e.g. female or hermaphrodite and sterile or male-only; female-fertile lemmas incised **Sorghum**
- 108(5). The 'bristles' spiny, markedly coalescent basally (but bristles slender, ciliate, coalescent only at the extreme base in *Cenchrus ciliaris*) **Cenchrus**
The 'bristles' relatively slender, not spiny 109
- 109(108). The 'bristles' persisting on the rachis; mature spikelet-bearing axes not disarticulating; female-fertile lemmas becoming distinctly indurated when mature, the margins tucked in onto the palea (*Paspalum*-type); paleas indurated **Setaria**
The 'bristles' deciduous with the spikelets; mature spikelet-bearing axes disarticulating; female-fertile lemmas not becoming indurated, the margins lying flat and exposed on the palea (*Digitaria*-type); paleas not indurated **Pennisetum**
- 110(5). Glumes of female-fertile spikelets all minute **Paratheria**
Glumes of female-fertile spikelets large 111
- 111(110). Lower glume of female-fertile spikelet nerveless 112
Lower glume of female-fertile spikelet 2–5(–6)-nerved **Setaria**
Lower glume of female-fertile spikelet 7–10-nerved **Sorghastrum**
- 112(111). Proximal incomplete florets of the female-fertile spikelets male, paleate (but the palea may be reduced or vestigial), the lemmas less firm than the female-fertile lemmas; glumes pointed; palea back rounded **Odontelytrum**
Proximal incomplete florets of the female-fertile spikelets sterile, epaleate, the lemmas similar in texture to the female-fertile lemmas; glumes

- not pointed; palea back 2-keeled **Pennisetum unisetum**
 113(4). Plant a reed; inflorescence a plumose panicle **Phragmites**
 Plant not a reed; inflorescence of spike-like main
 branches; lemmas awnless **Tetrachne**
 Plant not a reed; inflorescence a raceme or much
 contracted panicle; lemmas with hard prickly
 awns **Entoplocamia**

Key 3.

- 1(0). Inflorescence a single spike 2
 Inflorescence of spike-like main branches 20
 Inflorescence a false spike, with clusters of spikelets
 49
 Inflorescence a single raceme 55
 Inflorescence paniculate 69
 2(1). Female-fertile floret 1 per female-fertile spikelet 3
 Female-fertile florets more than 1 per female-fertile
 spikelet 11
 3(2). Female-fertile lemmas with a single median keel on
 the back 4
 Female-fertile lemmas rounded, flat or with two or
 more keels on the back 6
 4(3). Female-fertile spikelets disarticulating above the
 glumes; glumes very unequal, upper glume 2–3-
 nerved; female-fertile lemmas and glumes of
 similar texture; lemmas conspicuously hairy **Harpochloa**
 Female-fertile spikelets falling with the glumes;
 glumes equal or subequal in length, upper glume 1-
 nerved; female-fertile lemmas less firm than the
 glumes; lemmas not conspicuously hairy 5
 5(4). Plants caespitose; glumes of female-fertile spikelets
 awned, more or less similar in form and texture;
 palea conspicuous but less than 3/4 of female-
 fertile lemma length, nerveless **Perotis**
 Plants long-rhizomatous or stoloniferous; glumes of
 female-fertile spikelets not awned, very dissimilar
 in form or texture; palea 3/4 or more of female-
 fertile lemma length, with 2 well separated nerves
 **Mosdenia**
 6(3). Glumes of the female-fertile spikelets dorsiventral to
 the rachis 7
 Glumes of the female-fertile spikelets lateral to the
 rachis 10
 Glumes displaced, lateral to each other on the side
 away from the rachis **Parapholis**
 7(6). Female-fertile lemmas mucronate or awned; hairy
 callus present 8
 Female-fertile lemmas neither mucronate nor awned;
 no hairy callus 9
 8(7). Spikelets biseriate on one side of the rachis; female-
 fertile spikelets compressed dorsiventrally; lower
 glume 1-nerved; lemmas decidedly firmer than the
 glumes **Enteropogon**
 Spikelets distichously arranged on opposite sides of
 the rachis; female-fertile spikelets compressed
 laterally; lower glume nerveless; lemmas less firm
 than the glumes **Oropetium**
 9(7). Annual; female-fertile spikelets abaxial (with the
 lower glume on the side away from the rachis or
 with the upper lemma against the rachis), with
 female-fertile florets only; pericarp fused; embryo
 less than 1/3 the length of the grain **Hainardia**
 Perennial; female-fertile spikelets adaxial (with the
 lower glume against the rachis or with the upper
 lemma on the side away from the rachis), with
 incomplete florets in addition to the female-fertile
 florets; pericarp free; embryo at least 1/3 as long
 as the grain **Lepturus**
 10(6). Female-fertile lemmas 2-nerved; spikelets with
 female-fertile florets only; embryo at least 1/3 as
 long as the grain **Microchloa**
 Female-fertile lemmas 3–4-nerved; spikelets with
 incomplete florets in addition to the female-
 fertile florets; embryo less than 1/3 the length of
 the grain **Rendlia**
 11(2). Spikelets biseriate on one side of the rachis 12
 Spikelets distichously arranged on opposite sides of
 the rachis 15
 Spikelets not two-ranked (not biseriate, not
 distichously inserted) **Tribolium**
 12(11). Inflorescence digitate or subdigitate 13
 Inflorescence neither digitate nor subdigitate 14
 13(12). Female-fertile spikelets compressed dorsiventrally;
 glumes very unequal; lemmas not conspicuously
 hairy, back rounded, flat or with two or more
 keels; pericarp fused **Enteropogon**
 Female-fertile spikelets compressed laterally;
 glumes equal or subequal in length; lemmas
 conspicuously hairy, back with a single median
 keel; pericarp free **Tetrapogon**
 14(12). Rachilla of the female-fertile spikelets not
 disarticulating between the florets; glumes not
 pointed **Prionanthium**
 Rachilla of the female-fertile spikelets
 disarticulating between the florets; glumes
 pointed **Tribolium**
 15(11). Glumes of the female-fertile spikelets dorsiventral
 to the rachis; all spikelets more or less embedded
 in the rachis; ovary apex glabrous; lodicules
 glabrous 16
 Glumes of the female-fertile spikelets lateral to the
 rachis; spikelets not all embedded in the rachis;
 ovary apex hairy; lodicules ciliate 18
 16(15). Hairy callus present; female-fertile lemmas with a
 single median keel on the back; leaves mostly
 basal **Triopogon**
 No hairy callus; female-fertile lemmas rounded, flat
 or with two or more keels on the back; leaves not
 distinctly basally aggregated 17
 17(16). Female-fertile spikelets compressed laterally,
 disarticulating above the glumes; leaf auricles
 present; culm internodes conspicuously hollow;
 stigmas white **Lolium**
 Female-fertile spikelets compressed dorsiventrally,
 falling with the glumes; leaf auricles absent;
 culm internodes solid; stigmas pink, red, purple
 or black **Lepturus**
 18(15). Annual; plants caespitose; glumes subulate;
 lemmas with a single median keel on the back,
 the nerves apically non-confluent **Secale**
 Perennial; plants long-rhizomatous or
 stoloniferous; glumes not subulate; lemmas
 rounded, flat or with two or more keels on the
 back, the nerves confluent towards the tip 19
 19(18). Fresh shoots aromatic; mature spikelet-bearing axes
 disarticulating **Thinopyrum**
 Fresh shoots not aromatic; mature spikelet-bearing
 axes not disarticulating **Elytrigia**
 20(1). Inflorescence digitate or subdigitate 21
 Inflorescence neither digitate nor subdigitate 34
 21(20). Hairy callus present 22
 No hairy callus 29
 22(21). Female-fertile lemmas with a single median keel on
 the back 23
 Female-fertile lemmas rounded, flat or with two or
 more keels on the back 26
 23(22). Glumes very unequal in the intact female-fertile
 spikelet 24
 Glumes equal or subequal in length in the intact
 female-fertile spikelet 25
 24(23). Spikelets with conventional internode spacings;
 callus blunt; the distal florets reduced in size but

- not awnlike; leaves not distinctly basally aggregated; stigmas white **Chloris**
 Spikelets with distinctly elongated rachilla internodes between the florets; callus pointed; the distal florets reduced to awns; leaves mostly basal; stigmas golden-brown **Lophachme**
- 25(23). Female-fertile floret 1 per female-fertile spikelet; glumes very dissimilar in form or texture; pericarp fused **Brachyachne**
 Female-fertile florets more than 1 per female-fertile spikelet; glumes more or less similar in form and texture; pericarp free **Tetrapogon**
- 26(22). Female-fertile spikelets compressed laterally, the lemmas conspicuously hairy; pericarp free 27
 Female-fertile spikelets compressed dorsiventrally, the lemmas not conspicuously hairy; pericarp fused 28
- 27(26). Ligule fringed; female-fertile floret 1 per female-fertile spikelet; glumes approximately equalling or longer than the adjacent lemmas; grain compressed laterally **Schoenefeldia**
 Ligule not fringed; female-fertile florets more than 1 per female-fertile spikelet; glumes shorter than the adjacent lemmas; grain compressed dorsiventrally **Lintonia**
- 28(26). Spikelets solitary; female-fertile spikelets disarticulating above the glumes; glumes very unequal, hairless; lemmas decidedly firmer than the glumes **Enteropogon**
 Spikelets consistently paired; female-fertile spikelets falling with the glumes; glumes equal or subequal, hairy; lemmas less firm than the glumes **Eulalia**
- 29(21). Female-fertile floret 1 per female-fertile spikelet; pericarp fused 30
 Female-fertile florets more than 1 per female-fertile spikelet; pericarp free 32
- 30(29). Inflorescence axes ending in spikelets; female-fertile spikelets adaxial (with the lower glume against the rachis or with the upper lemma on the side away from the rachis), disarticulating above the glumes; glumes all shorter than the adjacent lemmas; styles free to their bases 31
 Inflorescence axes not ending in spikelets; female-fertile spikelets abaxial (with the lower glume on the side away from the rachis or with the upper lemma against the rachis), falling with the glumes; glumes approximately equalling or longer than the adjacent lemmas; styles fused basally **Spartina**
- 31(30). Plants long-rhizomatous or stoloniferous; glumes pointed, not awned, more or less similar in form and texture; culm internodes conspicuously hollow **Cynodon**
 Plants caespitose; glumes not pointed, awned, very dissimilar in form or texture; culm internodes solid; plants caespitose **Eustachys**
- 32(29). Inflorescence axes ending in spikelets; styles free to their bases 33
 Inflorescence axes not ending in spikelets; styles fused basally **Dactyloctenium**
- 33(32). Glumes very unequal in the intact female-fertile spikelet; lemmas entire; grain not grooved **Eleusine**
 Glumes equal or subequal in length in the intact female-fertile spikelet; lemmas incised; grain longitudinally grooved **Acrachne**
- 34(20). Female-fertile floret 1 per female-fertile spikelet 35
 Female-fertile florets more than 1 per female-fertile spikelet 39
- 35(34). Hairy callus present 36
 No hairy callus 37
- 36(35). Female-fertile spikelets compressed laterally, falling with the glumes; glumes lateral to the rachis, 1-keeled to middle or below; lemmas neither mucronate nor awned **Catalpis**
- Female-fertile spikelets compressed dorsiventrally, disarticulating above the glumes; glumes dorsiventral to the rachis, not 1-keeled; rounded, flat or with more than one keel; lemmas mucronate or awned **Polevansia**
- 37(35). Glumes very unequal in the intact female-fertile spikelet **Willkommia**
 Glumes equal or subequal in length in the intact female-fertile spikelet 38
- 38(37). Annual; female-fertile spikelets compressed laterally; glumes awned; spikelets with incomplete florets in addition to the female-fertile florets **Dinebra**
 Perennial; female-fertile spikelets compressed dorsiventrally; glumes not awned; female-fertile spikelets with female-fertile florets only **Craspedorhachis**
- 39(34). Glumes all shorter than the adjacent lemmas in the intact female-fertile spikelets 40
 Glumes approximately equalling or longer than the adjacent lemmas in the intact female-fertile spikelets 46
- 40(39). Female-fertile lemmas with a single median keel on the back 41
 Female-fertile lemmas rounded, flat or with two or more keels on the back 45
- 41(40). Female-fertile spikelets compressed laterally 42
 Female-fertile spikelets not noticeably compressed **Leptochloa**
- 42(41). Glumes of the female-fertile spikelets dorsiventral to the rachis 43
 Glumes of the female-fertile spikelets lateral to the rachis 44
- 43(42). Spikelets subsessile; spikelet-bearing rachises substantial; callus absent; grain longitudinally grooved; surface of grain sculptured **Acrachne**
 Some spikelets pedicellate; spikelet-bearing rachises slender; callus short; grain not grooved; surface of grain smooth **Leptochloa**
- 44(42). Spikelets biseriate on one side of the rachis; glumes very unequal in the intact female-fertile spikelet; lemmas entire, pointed; the 'racemes' without spikelets towards the base **Pogonarthria**
 Spikelets distichously arranged on opposite sides of the rachis; glumes equal or subequal in length in the intact female-fertile spikelet; lemmas incised, blunt; the 'racemes' spikelet-bearing to the base **Brachychloa**
- 45(40). Upper glume of female-fertile spikelet 1-nerved **Diplachne**
 Upper glume of female-fertile spikelet 2–3-nerved **Coelachyrum**
- 46(39). Ligule not fringed 47
 Ligule fringed 48
- 47(46). Some spikelets pedicellate; spikelets not all embedded in the rachis; rachilla of the female-fertile spikelets not disarticulating between the florets; lemmas with a single median keel on the back; leaves mostly basal **Bewsia**
 Spikelets subsessile; all spikelets more or less embedded in the rachis; rachilla of the female-fertile spikelets disarticulating between the florets; lemmas rounded, flat or with two or more keels on the back; leaves not distinctly basally aggregated **Trichoneura**
- 48(46). Glumes of female-fertile spikelets about equalling or longer than the spikelets, equal or subequal in length, awned; spikelets sessile; no hairy callus **Dinebra**
 Glumes of female-fertile spikelets markedly shorter than the spikelets, very unequal, not awned; spikelets subsessile; hairy callus present **Leptocarydion**
- 49(1). Ligule not fringed 50
 Ligule fringed 51
- 50(49). Spikelets without bractiform involucre; female-fertile floret 1 per female-fertile spikelet; lemmas

- rounded, flat or with two or more keels on the back, 5-nerved; palea 3/4 or more of lemma length **Hordeum**
- Spikelets with bractiform involucre; female-fertile florets more than 1 per female-fertile spikelet; lemmas with a single median keel on the back, 3-4-nerved; palea conspicuous but less than 3/4 of lemma length **Elytrophorus**
- 51(49). Female-fertile floret 1 per female-fertile spikelet 52
- Female-fertile florets more than 1 per female-fertile spikelet 54
- 52(51). Hairy callus present; glumes of female-fertile spikelets awned; lemmas mucronate or awned **Monelytrum**
- No hairy callus; glumes of female-fertile spikelets not awned; lemmas neither mucronate nor awned 53
- 53(52). Female-fertile spikelets disarticulating above the glumes; upper glume not spiny; lower glume 1-nerved; lemmas not conspicuously hairy; pericarp free **Sporobolus**
- Female-fertile spikelets falling with the glumes; upper glume spiny; lower glume nerveless; lemmas conspicuously hairy; pericarp fused **Tragus**
- 54(51). Spikelets with bractiform involucre; glumes approximately equalling or longer than the adjacent lemmas **Elytrophorus**
- Spikelets without bractiform involucre; glumes all shorter than the adjacent lemmas in the intact spikelets **Eragrostis**
- 55(1). Female-fertile spikelets disarticulating above the glumes 56
- Female-fertile spikelets falling with the glumes 66
- 56(55). Ligule not fringed 57
- Ligule fringed 60
- 57(56). Sheath margins usually joined to at least 1/4 of their length; ovary with a conspicuous apical appendage; grain compressed laterally **Bromus**
- Sheath margins free; ovary without a conspicuous apical appendage; grain compressed dorsiventrally 58
- 58(57). Glumes of female-fertile spikelets 1-keeled to middle or below; lemmas neither mucronate nor awned, blunt; hilum short **Catapodium**
- Glumes of female-fertile spikelets not 1-keeled: rounded, flat or with more than one keel; lemmas mucronate or awned, pointed; hilum long-linear 59
- 59(58). Glumes of female-fertile spikelets very dissimilar in form or texture; lemmas decidedly firmer than the glumes; palea apically notched; nodes glabrous; rachises neither flattened nor hollowed, not winged **Vulpia**
- Glumes of female-fertile spikelets more or less similar in form and texture; lemmas and glumes of similar texture; palea entire; nodes conspicuously hairy; rachises hollowed **Brachypodium**
- 60(56). Female-fertile floret 1 per female-fertile spikelet 61
- Female-fertile florets more than 1 per female-fertile spikelet 62
- 61(60). Inflorescence a solitary raceme, or digitate or subdigitate; hairy callus present; female-fertile lemmas mucronate or awned; pericarp fused; grain longitudinally grooved **Enteropogon**
- Inflorescence paniculate; no hairy callus; female-fertile lemmas neither mucronate nor awned; pericarp free; grain not grooved **Sporobolus**
- 62(60). Rachilla of the female-fertile spikelets not disarticulating between the florets **Prionanthium**
- Rachilla of the female-fertile spikelets disarticulating between the florets 63
- 63(62). Hairy callus present 64
- No hairy callus **Tribolium**
- 64(63). Glumes of female-fertile spikelets 1-keeled to middle or below; ovary apex glabrous; pericarp fused 65
- Glumes of female-fertile spikelets not 1-keeled: rounded, flat or with more than one keel; ovary apex hairy; pericarp free **Dregeochloa**
- 65(64). Inflorescence a solitary raceme or digitate or subdigitate; female-fertile spikelets compressed dorsiventrally; glumes very unequal in the intact female-fertile spikelet; lemmas decidedly firmer than the glumes, 3-4-nerved **Enteropogon**
- Inflorescence paniculate; female-fertile spikelets compressed laterally; glumes equal or subequal in length in the intact female-fertile spikelet; lemmas and glumes of similar texture, 8-9-nerved **Merxmüllera**
- 66(55). Spikelets with the distal incomplete florets and/or the rachilla apex forming a terminal clavate appendage; sheath margins joined for at least 1/4 of their length; glumes of female-fertile spikelets not 1-keeled: rounded, flat or with more than one keel **Melica**
- Spikelets without a terminal clavate appendage; sheath margins free; glumes of female-fertile spikelets 1-keeled to middle or below 67
- 67(66). Female-fertile floret 1 per female-fertile spikelet; lemmas entire, and with a single median keel on the back 68
- Female-fertile florets more than 1 per female-fertile spikelet; lemmas incised, and rounded, flat or with two or more keels on the back **Chaetobromus**
- 68(67). Female-fertile lemmas neither mucronate nor awned; palea conspicuous but less than 3/4 of female-fertile lemma length, nerveless; leaves not distinctly basally aggregated; styles fused basally **Perotis**
- Female-fertile lemmas mucronate or awned; palea 3/4 or more of female-fertile lemma length, with 2 well separated nerves; leaves mostly basal; styles free to their bases **Fingerhuthia**
- 69(1). Ligule not fringed 70
- Ligule fringed 74
- 70(69). Spikelets with the distal incomplete florets and/or the rachilla apex forming a terminal clavate appendage; female-fertile spikelets falling with the glumes; lodicules fused **Melica**
- Spikelets without a terminal clavate appendage; female-fertile spikelets disarticulating above the glumes; lodicules free 71
- 71(70). Sheath margins joined to at least 1/4 of their length; ovary with a conspicuous apical appendage; grain compressed laterally **Bromus**
- Sheath margins free; ovary without a conspicuous apical appendage; grain compressed dorsiventrally 72
- 72(71). Glumes of female-fertile spikelets 1-keeled to middle or below; lemmas neither mucronate nor awned, blunt; hilum short **Catapodium**
- Glumes of female-fertile spikelets not 1-keeled: rounded, flat or with more than one keel; lemmas mucronate or awned, pointed; hilum long-linear 73
- 73(72). Glumes of female-fertile spikelets very dissimilar in form or texture; lemmas decidedly firmer than the glumes; palea apically notched; rachises neither flattened nor hollowed, not winged; nodes glabrous **Vulpia**
- Glumes of female-fertile spikelets more or less similar in form and texture; lemmas and glumes of similar texture; palea entire; rachises hollowed; nodes conspicuously hairy **Brachypodium**

- 74(69). Female-fertile floret 1 per female-fertile spikelet 75
 Female-fertile florets more than 1 per female-fertile spikelet 77
- 75(74). Female-fertile lemmas neither mucronate nor awned; glumes hairless 76
 Female-fertile lemmas mucronate or awned; glumes hairy **Fingerhuthia**
- 76(75). Female-fertile spikelets disarticulating above the glumes; lower glume 1-nerved; lemmas not conspicuously hairy; no hairy callus; styles free to their bases **Sporobolus**
 Female-fertile spikelets falling with the glumes; lower glume nerveless; lemmas conspicuously hairy; hairy callus present; styles fused basally **Catalepis**
- 77(74). Hairy callus present 78
 No hairy callus 80
- 78(77). Female-fertile spikelets disarticulating above the glumes; culms unbranched vegetatively above 79
 Female-fertile spikelets falling with the glumes; culms branching vegetatively above **Chaetobromus**
- 79(78). Glumes of female-fertile spikelets 1-keeled to middle or below; palea similar in texture to the lemma; leaf blades rolled; ovary apex glabrous; stigmas white **Merxmüllera**
 Glumes of female-fertile spikelets not 1-keeled; rounded, flat or with more than one keel; palea thinner than the lemma; leaf blades folded; ovary apex hairy; stigmas pink, red, purple or black **Dregeochloa**
- 80(77). Upper glume of female-fertile spikelet 1-nerved **Eragrostis**
 Upper glume of female-fertile spikelet 2–3-nerved **Coelachyrum**
 Upper glume of female-fertile spikelet (4–) 5 (–6) nerved **Tribolium**

Key 4.

- 1(0). Ligule not fringed 2
 Ligule fringed 50
- 2(1). Female-fertile spikelets disarticulating above the glumes 3
 Female-fertile spikelets falling with the glumes 47
- 3(2). Female-fertile floret 1 per female-fertile spikelet 4
 Female-fertile florets more than 1 per female-fertile spikelet 18
- 4(3). Female-fertile spikelets with readily identifiable glumes, lemmas and paleas 5
 Female-fertile spikelets without glumes, unconventional and hard to interpret **Leersia**
- 5(4). Glumes very unequal in the intact female-fertile spikelet 6
 Glumes equal or subequal in length in the intact female-fertile spikelet 7
- 6(5). Leaf blades wider than 15 mm, transverse veins visible at least abaxially; glumes of female-fertile spikelets markedly shorter than the spikelets **Festuca africana**
 Leaf blades narrower than 15 mm, transverse veins very inconspicuous; glumes about equalling or longer than the spikelets **Arrhenatherum**
- 7(5). Glumes conspicuously ventricose basally **Gastridium**
 Glumes not ventricose 8
- 8(7). Spikelets secund, sexually distinct kinds present on the same plant — e.g. female or hermaphrodite and sterile or male-only **Cynosurus**
 Spikelets not secund, alike in sexuality on the same plant 9

- 9(8). Glumes all shorter than the adjacent lemmas in the intact female-fertile spikelets 10
 Glumes approximately equalling or longer than the adjacent lemmas in the intact female-fertile spikelets 11
- 10(9). Hairy callus present; female-fertile lemmas mucronate or awned, becoming distinctly indurated when mature; palea back rounded; hilum long-linear **Stipa**
 No hairy callus; female-fertile lemmas neither mucronate nor awned, not becoming indurated; palea back 2-keeled; hilum short ... **Colpodium**
- 11(9). Female-fertile lemmas less firm than the glumes 12
 Female-fertile lemmas and glumes of similar texture 13
 Female-fertile lemmas decidedly firmer than the glumes 15
- 12(11). Callus hairs present, more than 0.5 mm long ... **Calamagrostis**
 Callus hairs absent, or if present less than 0.5 mm long **Agrostis**
- 13(11). Perennial; glumes of female-fertile spikelets 1-keeled to middle or below; paleas with 3 or more well separated nerves; leaves mostly basal ... **Ammophila**
 Annual; glumes of female-fertile spikelets not 1-keeled; rounded, flat or with more than one keel; paleas with 2 well separated nerves; leaves not distinctly basally aggregated 14
- 14(13). Panicle open; callus pointed; glumes of female-fertile spikelets not awned; spikelets with incomplete florets in addition to the female-fertile florets; ovary apex hairy **Avena**
 Panicle contracted; callus blunt; glumes of female-fertile spikelets awned; female-fertile spikelets with female-fertile florets only; ovary apex glabrous **Lagurus**
- 15(11). Female-fertile florets gibbous, the lemma awn placed off-centre; embryo at least 1/3 as long as the grain; embryo waisted in surface view **Nassella**
 Female-fertile florets not as in *Nassella*; embryo less than 1/3 the length of the grain; embryo not waisted 16
- 16(15). Rachilla prolonged beyond uppermost female-fertile floret, or florets more than 2 17
 Rachilla not prolonged beyond the solitary female-fertile floret **Stipa**
- 17(16). Panicle open; callus pointed; glumes of female-fertile spikelets not awned; spikelets with incomplete florets in addition to the female-fertile florets; ovary apex hairy **Avena**
 Panicle contracted; callus blunt; glumes of female-fertile spikelets awned; female-fertile spikelets with female-fertile florets only; ovary apex glabrous **Lagurus**
- 18(3). Lemmas awned, the awn apically clavate, bearing a ring of minute hairs at the middle **Corynephorus**
 Lemmas without the characteristic *Corynephorus* awn 19
- 19(18). Leaf blades cordate at the base, transverse veins readily visible in the blade at least abaxially; lodicules absent in female-fertile florets **Megastachya**
 Leaf blades not cordate at the base; transverse veins very inconspicuous in the blade; lodicules present in female-fertile florets 20
- 20(19). Lemmas as broad as long, gibbous, cordate at the base **Briza**
 Lemmas not as in *Briza* 21
- 21(20). Female-fertile spikelets compressed laterally 22
 Female-fertile spikelets not noticeably compressed **Streblochaete**

- 22(21). Glumes of female-fertile spikelets very dissimilar in form or texture 23
 Glumes of female-fertile spikelets more or less similar in form and texture 24
- 23(22). Glumes very unequal in the intact female-fertile spikelet, not 1-keeled: rounded, flat or with more than one keel; lemmas decidedly firmer than the glumes, mucronate or awned, pointed . **Vulpia**
 Glumes equal or subequal in length in the intact female-fertile spikelet, 1-keeled to middle or below; lemmas and glumes of similar texture, the lemmas neither mucronate nor awned, blunt **Catapodium**
- 24(22). Spikelets of sexually distinct kinds on the same plant — e.g. female or hermaphrodite and sterile or male-only **Cynosurus**
 Spikelets alike in sexuality on the same plant . 25
- 25(24). Glumes all shorter than the adjacent lemmas in the intact female-fertile spikelets 26
 Glumes approximately equalling or longer than the adjacent lemmas in the intact female-fertile spikelets 42
- 26(25). Upper glume of female-fertile spikelet 1-nerved . 27
 Upper glume of female-fertile spikelet 2–3-nerved 29
 Upper glume of female-fertile spikelet (4–)5–(6)-nerved 40
 Upper glume of female-fertile spikelet 7–10-nerved 41
- 27(26). Lower glume of female-fertile spikelet nerveless **Sphenopus**
 Lower glume of female-fertile spikelet 1-nerved . 28
- 28(27). Female-fertile spikelets less than 3 mm long; stamens 2 per female-fertile floret; lodicules fleshy; hilum short; embryo at least 1/3 as long as the grain **Diandrochloa**
 Female-fertile spikelets more than 6 mm long; stamens 3 per female-fertile floret; lodicules membranous; hilum long-linear; embryo less than 1/3 the length of the grain **Festuca**
- 29(26). Female-fertile lemmas and glumes of similar texture 30
 Female-fertile lemmas decidedly firmer than the glumes 39
- 30(29). Female-fertile lemmas with a single median keel on the back 31
 Female-fertile lemmas rounded, flat or with two or more keels on the back 35
- 31(30). Sheath margins joined to at least 1/4 of their length 32
 Sheath margins free 33
- 32(31). Leaves mostly basal; ovary apex glabrous, without a conspicuous apical appendage; mature grain less than 4 mm long; caryopsis free from both lemma and palea **Poa**
 Leaves not distinctly basally aggregated; ovary apex hairy, with a conspicuous apical appendage; mature grain 4–10 mm long; caryopsis adhering to lemma and/or palea **Bromus**
- 33(31). Palea thinner than the lemma 34
 Palea similar in texture to the lemma **Poa**
- 34(33). Annual **Lophochloa**
 Perennial **Koeleria**
- 35(30). Glumes very unequal in the intact female-fertile spikelet 36
 Glumes equal or subequal in length in the intact female-fertile spikelet 38
- 36(35). Ovary with a conspicuous apical appendage; grain compressed laterally; lodicules not toothed **Bromus**
 Ovary without a conspicuous apical appendage; grain compressed dorsiventrally; lodicules toothed 37
- 37(36). Lemmas 3.5–11.0 mm long, tips firm, acute; hilum long-linear **Festuca**
 Lemmas 1–3 mm long, tips scarious, blunt, often somewhat ragged; hilum short **Puccinellia**
- 38(35). Sheath margins joined to at least 1/4 of their length; ovary apex hairy, with a conspicuous apical appendage; caryopsis adhering to lemma and/or palea; mature grain 4–10 mm long . . **Bromus**
 Sheath margins free; ovary apex glabrous, without a conspicuous apical appendage; caryopsis free from both lemma and palea; mature grain less than 4 mm long **Catapodium**
- 39(29). Callus pointed, hairy; female-fertile lemmas incised, back rounded, flat or with two or more keels; rachilla hairy **Helictotrichon**
 Callus blunt, not hairy; female-fertile lemmas entire, back with a single median keel; rachilla not hairy **Dactylis**
- 40(26). Ovary with a conspicuous apical appendage; ligule not truncate; grain compressed laterally; lodicules not toothed **Bromus**
 Ovary without a conspicuous apical appendage; ligule truncate; grain compressed dorsiventrally; lodicules toothed **Festuca**
- 41(26). Sheath margins joined to at least 1/4 of their length; ovary with a conspicuous apical appendage; rachises neither flattened nor hollowed, not winged; grain compressed laterally; lodicules glabrous **Bromus**
 Sheath margins free; ovary without a conspicuous apical appendage; rachises hollowed; grain compressed dorsiventrally; lodicules ciliate **Brachypodium**
- 42(25). Female-fertile lemmas with a single median keel on the back; grain not grooved 43
 Female-fertile lemmas rounded, flat or with two or more keels on the back; grain longitudinally grooved 44
- 43(42). Annual **Lophochloa**
 Perennial **Koeleria**
- 44(42). Callus pointed; ovary apex hairy; mature grain 4–10 mm long; hilum long-linear **Avena**
 Callus blunt; ovary apex glabrous; mature grain less than 4 mm long; hilum short 45
- 45(44). Rachilla hairy; caryopsis free from both lemma and palea **Deschampsia**
 Rachilla not hairy; caryopsis adhering to lemma and/or palea 46
- 46(45). Glumes about equalling the spikelets; spikelets with conventional internode spacing **Aira**
 Glumes shorter than the spikelets; spikelets with an elongated rachilla internode between the florets **Periballia**
- 47(2). Spikelets with the distal incomplete florets and/or the rachilla apex forming a terminal clavate appendage; sheath margins joined to at least 1/4 of their length; lodicules fleshy **Melica**
 Spikelets without a terminal clavate appendage; sheath margins free; lodicules membranous . 48
- 48(47). Spikelets second; spikelets of sexually distinct kinds on the same plant — e.g. female or hermaphrodite and sterile or male-only; mature spikelet-bearing axes disarticulating **Lamarckia**
 Spikelets not second; spikelets alike in sexuality on the same plant; mature spikelet-bearing axes not disarticulating 49
- 49(48). Glumes of female-fertile spikelets 1-keeled to middle or below; upper glume 2–3-nerved; lemmas with a single median keel on the back, decidedly firmer than the glumes; spikelets with incomplete florets in addition to the female-fertile florets **Holcus**
 Glumes of female-fertile spikelets not 1-keeled: rounded, flat or with more than one keel; upper

- glume 1-nerved; lemmas rounded, flat or with two or more keels on the back, less firm than the glumes; female-fertile spikelets with female-fertile florets only **Polypogon**
- 50(1). Female-fertile spikelets disarticulating above the glumes 51
 Female-fertile spikelets falling with the glumes 88
- 51(50). Female-fertile floret 1 per female-fertile spikelet 52
 Female-fertile florets more than 1 per female-fertile spikelet 63
- 52(51). Ovary apex hairy **Pentameris** sp. 2
 Ovary apex glabrous 53
- 53(52). Female-fertile lemmas neither mucronate nor awned 54
 Female-fertile lemmas mucronate or awned 55
- 54(53). Lower glume of female-fertile spikelet 1-nerved, upper glume 1-nerved; lemmas not conspicuously hairy; embryo at least 1/3 as long as the grain **Sporobolus**
 Lower glume of female-fertile spikelet 2–3-nerved, upper glume 2–3-nerved; lemmas conspicuously hairy; embryo less than 1/3 the length of the grain **Pentastichis pusilla**
- 55(53). Awns trifid, usually with a basal column (but not trifid in *Aristida parvula* or *Stipagrostis anomala*) 56
 Awns not trifid 58
- 56(55). Awns plumose (but not plumose in *Stipagrostis anomala*); paleas of female-fertile florets indurated **Stipagrostis**
 Awns not plumose; paleas of female-fertile florets not indurated 57
- 57(56). Glumes of female-fertile spikelets 1-keeled to middle or below; lower glume 1-nerved; mature female-fertile lemmas with a clear germination flap; grain not grooved; embryo at least 1/3 as long as the grain **Aristida**
 Glumes of female-fertile spikelets not 1-keeled; rounded, flat or with more than one keel; lower glume 2–3-nerved; no germination flap in the female-fertile lemmas; grain longitudinally grooved; embryo less than 1/3 the length of the grain **Sartidia**
- 58(55). Hairy callus present 59
 No hairy callus 62
- 59(58). Female-fertile lemmas and paleas becoming distinctly indurated when mature; palea back rounded; female-fertile spikelets with female-fertile florets only; hilum long-linear **Stipa**
 Female-fertile lemmas and paleas not becoming indurated; palea back 2-keeled; spikelets with incomplete florets in addition to the female-fertile florets; hilum short 60
- 60(59). Female-fertile lemmas conspicuously hairy; incomplete florets distal to the female-fertile florets 61
 Female-fertile lemmas not conspicuously hairy; incomplete florets proximal to the female-fertile florets **Arundinella**
- 61(60). Rachilla of the female-fertile spikelets not disarticulating between the florets; lemmas decidedly firmer than the glumes, incised, 8–9-nerved; leaves not distinctly basally aggregated **Enneapogon**
 Rachilla of the female-fertile spikelets disarticulating between the florets; lemmas and glumes of similar texture, the lemmas entire, 3–4-nerved; leaves mostly basal **Stiburus**
- 62(58). Glumes of female-fertile spikelets awned; lemmas 2-lobed, 5-nerved; palea apically notched; female-fertile spikelets with female-fertile florets only **Lagurus**
 Glumes of female-fertile spikelets not awned; lemmas 9-lobed, 8–9-nerved; palea entire; spikelets with incomplete florets in addition to the female-fertile florets **Enneapogon**
- 63(51). Glumes all shorter than the adjacent lemmas in the intact female-fertile spikelets 64
 Glumes approximately equalling or longer than the adjacent lemmas in the intact female-fertile spikelets 70
- 64(63). Leaves hard, woody, needle-like, plants prickly 65
 Leaves not needle-like, plants not prickly 66
- 65(64). Glumes very unequal in the intact female-fertile spikelet, lower glume 1-nerved, upper glume 1-nerved; lemmas incised, mucronate **Odyssea**
 Glumes equal or subequal in length in the intact female-fertile spikelet, lower glume 2–3-nerved, upper glume 2–3-nerved; lemmas entire, neither mucronate nor awned **Cladoraphis**
- 66(64). Hairy callus present 67
 No hairy callus 69
- 67(66). Female-fertile lemmas entire **Stiburus**
 Female-fertile lemmas incised 68
- 68(67). Female-fertile lemmas deeply cleft; grain trigonous; fruit linear; hilum short; embryo at least 1/3 as long as the grain **Triraphis**
 Female-fertile lemmas not deeply cleft; grain not noticeably compressed; fruit fusiform; hilum long-linear; embryo less than 1/3 the length of the grain **Styppeiochloa**
- 69(66). Upper glume of female-fertile spikelet 1-nerved **Eragrostis**
 Upper glume of female-fertile spikelet 2–3-nerved **Coelachyrum**
 Upper glume of female-fertile spikelet (4–)5(–6)-nerved **Tribolium**
- 70(63). Rachilla of the female-fertile spikelets not disarticulating between the florets 71
 Rachilla of the female-fertile spikelets disarticulating between the florets 73
- 71(70). Callus absent; female-fertile lemmas not deeply cleft, becoming distinctly indurated when mature; palea apically notched **Kaokochloa**
 Callus short; female-fertile deeply cleft, not becoming indurated; palea entire 72
- 72(71). Female-fertile lemmas 9-lobed, with 9 awns (one terminating each lobe); anthers up to 2.5 mm long **Enneapogon**
 Female-fertile lemmas 6-lobed, with 5 awns (one arising between each pair of lobes); anthers more than 2.5 mm long **Schmidtia**
- 73(70). Panicle open 74
 Panicle contracted 77
- 74(73). Callus short, blunt 75
 Callus long, pointed **Cortaderia**
- 75(74). Leaf blades wider than 15 mm; plants long-rhizomatous or stoloniferous; young vegetative shoots bursting through the bases of subtending sheaths **Arundo**
 Leaf blades narrower than 15 mm; plants usually caespitose; young vegetative shoots emerging from between the subtending sheaths and the stem 76
- 76(75). Ovary apex hairy; female-fertile lemmas deeply cleft; fruit with a hard, thick pericarp; hilum long-linear **Pentameris**
 Ovary apex glabrous; female-fertile lemmas not deeply cleft; fruit with a membranous pericarp; hilum short **Pentastichis**
- 77(73). Female-fertile lemmas entire 78
 Female-fertile lemmas incised 79
- 78(77). Hairy callus present; lower glume of female-fertile spikelet 1-nerved, upper glume 1-nerved; grain not noticeably compressed **Stiburus**
 No hairy callus; lower glume of female-fertile spikelet (4–)5(–6)-nerved, upper glume (4–)5(–6)-nerved; grain compressed dorsiventrally **Tribolium**

- 79(77). Palea thinner than the lemma 80
 Palea similar in texture to the lemma 82
- 80(79). Spikelets with conventional internode spacings 81
 Spikelets with a distinctly elongated internode between the glumes **Centropodia**
- 81(80). Hairs of the female-fertile lemmas in tufts in transverse rows; grain longitudinally grooved; pericarp free; ovary apex hairy ... **Dregeochloa**
 Hairs of the female-fertile lemmas not in tufts, not in transverse rows; grain not grooved; pericarp fused; ovary apex glabrous **Schismus**
- 82(79). Female-fertile lemmas and glumes of similar texture 83
 Female-fertile lemmas decidedly firmer than the glumes 87
- 83(82). Ovary apex glabrous 84
 Ovary apex hairy **Pentameris**
- 84(83). Female-fertile spikelets with female-fertile florets only **Pentascchistis**
 Spikelets with incomplete florets in addition to the female-fertile florets 85
- 85(84). Female-fertile lemmas with a bent awn, twisted below (except *Merxmuellera macowanii*) ... 86
 Female-fertile lemmas awnless, mucronate or with a short straight awn **Schismus**
- 86(85). Spikelets 8–25 mm long, inflorescence longer than 60 mm; lodicules membranous **Merxmuellera**
 Spikelets 4–6(–7) mm long, inflorescence 10–60 mm long; lodicules fleshy **Karroochloa**
- 87(82). Ovary apex hairy; callus short, blunt; female-fertile lemma margins lying flat and exposed on the palea (*Digitaria*-type); styles free to their bases **Pentameris**
 Ovary apex glabrous; callus long, pointed; female-fertile lemma margins tucked in onto the palea (*Paspalum*-type); styles fused basally **Pseudopentameris**
- 88(50). Lower glume of female-fertile spikelet nerveless **Catalepis**
 Lower glume of female-fertile spikelet 1-nerved 89
 Lower glume of female-fertile spikelet (4–)5(–6)-nerved 91
 Lower glume of female-fertile spikelet 7–10-nerved 93
- 89(88). Glumes of female-fertile spikelets markedly shorter than the spikelets, shorter than the adjacent lemmas; palea thinner than the lemma **Eragrostis**
 Glumes of female-fertile spikelets about equalling or longer than the spikelets and the adjacent lemmas; palea similar in texture to the lemma 90
- 90(89). Upper glume of female-fertile spikelet 1-nerved; the distal florets seemingly merely underdeveloped, neither clearly specialised nor peculiarly modified in form; leaves mostly basal; lodicules fleshy **Fingerhuthia**
 Upper glume of female-fertile spikelet 2–3-nerved; the distal florets clearly specialised, peculiarly modified; leaves not distinctly basally aggregated; lodicules membranous ... **Holcus**
- 91(88). Spikelets of sexually distinct kinds on the same plant — e.g. female or hermaphrodite and sterile or male-only; glumes of female-fertile spikelets awned; lemmas entire; inflorescence deciduous in its entirety as a 'tumbleweed'; pericarp free **Urochlaena**
 Spikelets alike in sexuality on the same plant; glumes of female-fertile spikelets not awned; lemmas incised; inflorescence not becoming tumbleweed; pericarp fused 92
- 92(91). Culms branching vegetatively above; female-fertile lemmas with a bent awn, twisted below; grain longitudinally grooved, compressed laterally; hilum long-linear **Chaetobromus**
 Culms unbranched vegetatively above; female-fertile lemmas awnless, mucronate or with a short straight awn; grain not grooved, compressed dorsiventrally; hilum short **Schismus**
- 93(88). Culms branching vegetatively above; female-fertile lemmas with a bent awn, twisted below; grain longitudinally grooved, compressed laterally; hilum long-linear **Chaetobromus**
 Culms unbranched vegetatively above; female-fertile lemmas awnless, mucronate or with a short straight awn; grain not grooved, compressed dorsiventrally; hilum short **Schismus**

SYNOPSIS OF CLASSIFICATION

In the main body of this book the genera appear in alphabetical order. The convenience of this arrangement seemed to outweigh the advantages to be gained from imposing an overall taxonomic sequence, especially given the instability of higher classification in the grasses. The main disadvantage to an alphabetical arrangement is that groups of related genera are not placed together in the text. The following outline of grass classification is therefore included to serve as a quick reference to indicate supposed relationships. The sequences of genera were developed by means of INTKEY operations in conjunction with the results of numerical analysis of the descriptions in the world generic database. They are intended to reflect true taxonomic relationships and thus to indicate where problems may be encountered in identifying closely related genera.

A full formal classification of the southern African grasses, with descriptions of subfamilies, supertribes, tribes and subtribes appears on p. 381. The number of genera and species occurring in each subfamily in southern Africa is given in Table 1, p. 5.

Family: POACEAE

Subfamily: POOIDEAE

Supertribe: Triticodae

Tribe: *Triticeae*. *Secale*, *Hordeum*, *Elytrigia*, *Thinopyrum*

Tribe: *Brachypodieae*. *Brachypodium*

Tribe: *Bromeae*. *Bromus*

Supertribe: Poodae

Tribe: *Aveneae* (including *Agrostideae*, *Phalarideae*). *Avena*, *Arrhenatherum*, *Helictotrichon*, *Anthoxanthum*, *Holcus*, *Phalaris*, *Koeleria*, *Lophochloa*, *Agrostis*, *Polypogon*, *Calamagrostis*, *Ammophila*, *Gastridium*, *Lagurus*, *Corynephorus*, *Deschampsia*, *Aira*, *Periballia*

Tribe: *Meliceae*. *Melica*, *Streblochaete*

Tribe: *Poeae* (including *Hainardieae*, *Monermeae*). *Puccinellia*, *Colpodium*, *Festuca*, *Lolium*, *Vulpia*, *Catapodium*, *Poa*, *Sphenopus*, *Briza*, *Dactylis*, *Cynosurus*, *Lamarckia*, *Hainardia*, *Parapholis*

Subfamily: BAMBUSOIDEAE

Supertribe: Oryzodae

Tribe: *Oryzeae*. *Leersia*, *Oryza*, *Prosphytochloa*

Tribe: *Olyreae*. *Olyra*

Tribe: *Centothecae*. *Megastachya*

Tribe: *Ehrharteae*. *Ehrharta*, *Microlaena*

Supertribe: Bambusodae

Tribe: *Bambuseae*. *Thamnocalamus*, *Oxytenanthera*, *Bambusa*

Subfamily: ARUNDINOIDEAE

Tribe: *Stipeae*. *Stipa*, *Nassella*

Tribe: *Arundineae*. *Phragmites*, *Arundo*

Tribe: *Danthonieae*. *Prionanthium*, *Tribolium*, *Styppeiochloa*, *Pentaschistis*, *Schismus*, *Karoochloa*, *Chaetobromus*, *Dregeochloa*, *Centropodia*, *Pentameris*, *Merxmüllera*, *Pseudopentameris*, *Elytrophorus*, *Urochlaena*, *Cortaderia*

Tribe: *Aristideae*. *Aristida*, *Sartidia*, *Stipagrostis*

Subfamily: CHLORIDOIDEAE

Tribe: *Pappophoreae*. *Enneapogon*, *Kaokochloa*, *Schmidia*

Tribe: *Chlorideae* (including *Cynodontae*, *Eragrostae*, *Sporoboleae*, *Leptureae*, *Trageae*, *Spartineae*). *Tetrachne*, *Fingerhuthia*, *Entoplocamia*, *Eragrostis*, *Diandrochloa*, *Cladoraphis*, *Triraphis*, *Stiburus*, *Sporobolus*, *Eleusine*, *Pogonarthria*, *Leptochloa*, *Diplachne*, *Odysea*, *Brachychloa*, *Tetrapogon*, *Acrachne*, *Dactyloctenium*, *Enteropogon*, *Schoenefeldia*, *Leptocarydion*, *Lintonia*, *Chloris*, *Brachyachne*, *Dinebra*, *Coelachyum*, *Harpochoa*, *Bewisia*, *Trichoneura*, *Lophachme*, *Craspedorhachis*, *Willkommia*, *Polevansia*, *Ctenium*, *Microchloa*, *Eustachys*, *Cynodon*, *Rendlia*, *Spartina*, *Lepturus*, *Catalepis*, *Tragus*, *Monelytrum*, *Perotis*, *Mosdenia*, *Tripogon*, *Oropetium*

Subfamily: PANICOIDEAE

Supertribe: Panicodae

Tribe: *Paniceae*. *Pseudechinolaena*, *Tricholaena*, *Melinis*, *Entolasia*, *Acroceras*, *Oplismenus*, *Sacciolepis*, *Panicum*, *Paspalum*, *Oryzidium*, *Leucophrys*, *Brachiaria*, *Urochloa*, *Eriochloa*, *Digitaria*, *Tarigidia*, *Stereochlaena*, *Alloteropsis*, *Megaloprotachne*, *Axonopus*, *Echinochloa*, *Paspalidium*, *Stenotaphrum*, *Paratheria*, *Setaria*, *Pennisetum*, *Cenchrus*, *Anthephora*, *Odontelytrum*

Tribe: *Arundinelleae*. *Arundinella*, *Danthoniopsis*, *Loudetia*, *Tristachya*, *Trichopteryx*

Supertribe: **Andropogonodae**Tribe: **Andropogoneae**

Subtribe: Andropogoninae. *Miscanthus*, *Imperata*,
Eulalia, *Eriochrysis*, *Microstegium*, *Sorghum*,
Sorghastrum, *Chrysopogon*, *Vetiveria*,
Cleistachne, *Trachypogon*, *Heteropogon*,
Arthraxon, *Dichanthium*, *Bothriochloa*,
Andropogon, *Schizachyrium*, *Cymbopogon*,
Diheteropogon, *Monocymbium*, *Themeda*,
Hyperthelia, *Elymandra*, *Hyparrhenia*,
Ischaemum, *Sehima*, *Thelepogon*

Subtribe: Rottboelliinae. *Phacelurus*, *Vossia*,
Rhytachne, *Urelytrum*, *Hemarthria*, *Elionurus*,
Rottboellia, *Coelorhachis*, *Hackelochloa*,
Oxyrhachis

Tribe: **Maydeae**. *Coix*

GENERA AND SPECIES

Acrachne Wright & Arn. ex Chiov.

Arthrochloa Lorch, *Camusia* Lorch, *Normanboria* Butzin.

Annual; caespitose. Culms 120–800 mm high; herbaceous. Leaf blades linear (broadly, tapered to a hairlike tip); flat. *Ligule a fringed membrane to a fringe of hairs.*

Inflorescence of spike-like main branches; digitate or subdigitate (usually with the lower spikes scattered, but becoming subdigitate above), or non-digitate (*A. racemosa*); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; 5.5–13 mm long; compressed laterally; disarticulating above the glumes, or falling with the glumes, or not disarticulating (the lemmas falling acropetally from the rachilla, but the spikelet often falling wholly or in part before all the lemmas have been shed); not disarticulating between the florets, or disarticulating between the florets (the rachilla tough or breaking irregularly, the paleas persistent). *Glumes* two; relatively large; *more or less equal*; markedly shorter than the spikelets; awnless (but subulate via an excurrent mid-nerve); similar (thinly cartilaginous). Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.

Female-fertile florets 8–20. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (cartilaginous); 3 nerved (the laterals closer to the margins than to the mid-nerve, and excurrent as small teeth); incised; mucronate (from the midnerve). Palea present (lanceolate). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (0.8–1.1 mm long); ellipsoid; hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 3 species. Abyssinia, southern Africa, Indochina, Indomalayan region, Australia. Mesophytic; in shade and in open habitats (sandy savanna); glycophytic. Namibia, Botswana, Transvaal, and Swaziland. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Acrachne racemosa (Roem. & Schult.) Ohwi

Fig. 10. Pl. 1.

(= *A. verticillata* (Roxb.)

Chiov.) 2.

Annual; tufted (culms erect or geniculately ascending); 120–800 mm tall. Leaf blades 120–200 mm long; 8–15 mm wide. Spikelets 6–9 mm long. Inflorescence with 5–10 spike-like racemes in 1–3 whorls; spikelets 10–15-flowered; glumes and lemmas extending into awns 1/3–2/3 their length.

Flowering January to April. Sandy soil in moist and shady places. Locally common. Biome: Savanna and Nama-Karoo. Old world tropics, West Indies.

Description: Chippindall & Crook 1976 (41), Chippindall 1955 (132), Clayton et al. 1970–1982 (258). Illustration: Chippindall 1955 (fig. 105), Clayton et al. 1970–1982 (fig. 71). Voucher: Pienaar 253. PRECIS code 9903311–00100.

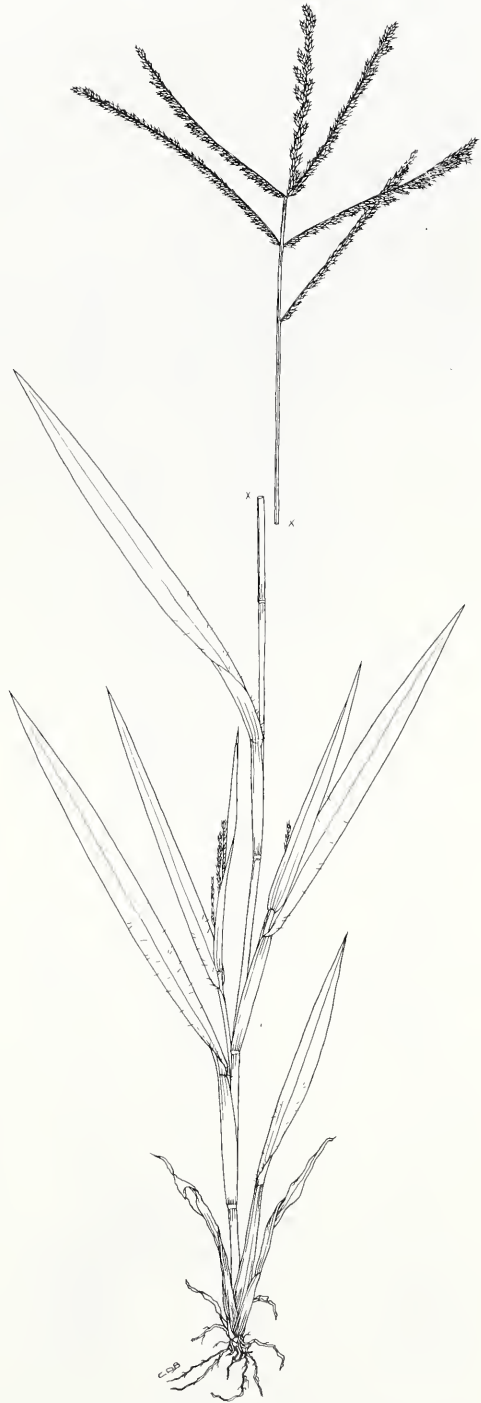


Fig. 10. *Acrachne racemosa*

Acroceras Stapf

Neohusnotia A. Camus.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or decumbent. Culms 100–1250 mm high; herbaceous (often much-branched). *Leaf blades* linear-lanceolate to ovate-lanceolate; *cordate* (somewhat amplexicaul). *Ligule* a fringed membrane (very narrow), or a fringe of hairs. Plants with hermaphrodite florets. The spikelets all alike in sexuality.

Inflorescence of spike-like main branches (racemes or panicles), or paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets in pairs; consistently in 'long-and-short' combinations (in lower parts of panicle), or not in distinct 'long-and-short' combinations; abaxial; *compressed laterally to not noticeably compressed (terete below)*; falling with the glumes. Glumes two; very unequal; awnless; similar (membranous). *Proximal incomplete florets* 1; paleate, palea fully developed; male, or sterile.

Female-fertile florets 1. *Lemmas* decidedly firmer than the glumes; smooth to striate; becoming indurated, or not becoming indurated; hairless (shiny); having the margins tucked in onto the palea; with a clear germination flap; 5 nerved; entire; *crested at the tip*; awnless (the apex blunt, hard, laterally compressed). Palea present (the tip reflexed);

relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum long-linear (half to two thirds the fruit length).

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicoideae; Paniceae. 15 species. Africa, Madagascar, Indomalayan region. Hydrophytic to mesophytic; in shade and in open habitats (shallow water, damp places and forests); glycophytic. Namibia, Botswana, Transvaal, Natal, and Cape Province. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by H.M. Anderson.

Acroceras macrum Stapf

Nile grass.

Perennial; rhizomatous and tufted; 400–1100 mm tall. Leaf blades to 120 mm long; 10 mm wide. Spikelets 4–5 mm long; 1.5 mm wide. Rhizome creeping extensively; ligule a very short rim of hairs; spikelets with conspicuous, indurated, rounded appendages at the laterally compressed apex of the glumes and lemmas; lower glume 2/3 the length of the spikelet; upper glume equalling the length of the spikelet.

Flowering November to July. Grows in flooded areas near rivers, swamps or vleis. Infrequent. Biome: Savanna. Tropical Africa. Cultivated pasture.

Description: Chippindall 1955 (386). Illustration: Chippindall 1955 (fig. 329). Voucher: Smith 413. PRECIS code 9901121-00100.



Fig. 11. Pl. 2.



H. Wanda-de-Jong

Fig. 11. *Acroceras macrum*

Agrostis L.

Agraulis P. Beauv., *Agrestis* Bub., *Anomalotis* Steud., *Bromidium* Nees, *Candollea* Steud., *Chaetotropis* Kunth, *Decandolea* Batard, *Didymochaeta* Steud., *Lachnagrostis* Trin., *Neoschischkinia* Tselev, *Notonema* Raf., *Pentatherum* Nabelek, *Podagrostis* (Griseb.) Scribn., *Senisetum* Koidz., *Trichodium* Michaux, *Vilfa* Adans.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 30–1500 mm high; herbaceous; unbranched above. Leaf blades linear; usually flat, or rolled (convolute, or canaliculate). *Ligule* an unfripped membrane.

Inflorescence paniculate; open, or contracted (e.g., *Bromidium*); espatheate. Spikelet-bearing axes persistent.

Spikelets 0.8–4 mm long; compressed laterally; *disarticulating above the glumes*. *Callus hairs* absent, or if present less than 0.5 mm long. Glumes two; more or less equal; nearly always about equalling the spikelets to much exceeding the spikelets (very rarely shorter); awnless; similar (usually narrow, membranous). *All florets female-fertile; proximal incomplete florets* absent.

Female-fertile florets 1. *Lemmas* less firm than the glumes (thinly membranous to hyaline); 3–5 nerved; entire to incised (usually truncate or emarginate, sometimes toothed via excurrent veins); awnless, or mucronate, or awned. Awns when present 1, or 3 (*Bromidium*), or 5 (rarely); median, or median and lateral (by extension of the lateral veins). The median awn different in form from the laterals (when laterals present); dorsal; geniculate; much shorter than the body of the lemma to about as long as the body of the lemma, or rarely much longer than the body of the lemma. Palea nearly always present; relatively long, or conspicuous but relatively short, or very reduced. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. About 220 species. Temperate. Helophytic, or mesophytic, or xerophytic (rarely); in shade and in open habitats (grassland, light woodland); maritime-arenicolous (rarely), or glycophytic. Namibia, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (9), naturalized species (2–3).

Intergeneric hybrids with *Polypogon* (*X Agropogon* P. Fourn.), *Calamagrostis*.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1970. FTEA. 3. Smook & Stirton. 1979. Bothalia 12: 637.

Species treatment by G.E. Gibbs Russell.

- 1(0). Glumes 3.5–5 mm long 2
 Glumes to 3.5 mm long 7
 2(1). Glumes with middle nerve extending into a short awn *A. polypogonoides*
 Glumes acute, without an awn 3
 3(2). Panicle narrow and spike-like, the spikelets closely imbricate on appressed branches . . . *A. continuata*
 Panicle spreading, spikelets not closely imbricate . . . 4
 4(3). Plant annual, lemmas 4-nerved *A. avenacea*
 Plant perennial, lemmas 5-nerved 5
 5(4). Leaf blades 2–6 mm across; lemmas awned from near the base; rachillas produced as a hairy bristle; panicle branches flexuous, spreading at maturity *A. barbuligera* var. *barbuligera*
 Leaf blades 1–2 mm across; lemmas awned from about the middle; rachillas not produced; panicle branches rigid, straight, ascending 6
 6(5). Leaf blades folded *A. eriantha* var. *eriantha*
 Leaf blades flat *A. eriantha* var. *planifolia*
 7(1). Pedicels more than 5 mm long, spikelets widely separated; panicles very diffuse 8
 Pedicels less than 5 mm long, the spikelets close together; panicles not diffuse, open or compact 10
 8(7). Pedicels 20 mm long or more; paleas absent *A. montevidensis*
 Pedicels 5–10 mm long; paleas present 9
 9(8). Glumes 1.5–2.5 mm long *A. bergiana* var. *bergiana*
 Glumes 2.5–3.0 mm long *A. bergiana* var. *laevisulca*
 10(7). Panicles 150–400 mm long, narrow and sinuous, the branches held nearly erect 11
 Panicles to 200 mm long, open or compact, the branches ascending to spreading 12
 11(10). Lemmas hairy . . . *A. lachnantha* var. *lachnantha*
 Lemmas glabrous . . . *A. lachnantha* var. *glabra*
 12(10). Lemmas glabrous; rachillas not produced . . . 13
 Lemmas hairy; rachillas produced 14
 13(12). Plants 400–750 mm tall, perennial, often stoloniferous; leaf blades flat, 3–5 mm wide; glumes greenish or purple-tinged . . . *A. gigantea*
 Plants 50–300 mm tall, delicate, annual or weakly perennial; leaf blades folded, 0.5–1.0 mm wide; glumes usually dark purple . . . *A. subulifolia*
 14(12). Rachillas 1/2–3/4 length of floret; glumes tinged with purple; southwestern Cape . . . *A. schlechteri*
 Rachillas less than 1/2 length of floret; glumes light green; plants not restricted to southwestern Cape 15
 15(14). Plant an annual weed; lemma hairs not spreading, usually not longer than lemmas; lemmas 4-nerved *A. avenacea*
 Plant an indigenous perennial; lemma hairs spreading, longer than lemmas; lemmas 5-nerved *A. barbuligera* var. *longipilosa*



Fig. 12. *Agrostis eriantha* var. *eriantha*

Agrostis avenacea Gmel.

Bent grass, blown grass.

Annual; 180–600 mm tall. Leaf blades to 170 mm long; about 2 mm wide. Spikelets 2.5–4.0 mm long. Inflorescence open, 80–190 mm long; rachilla less than 1/2 the length of the floret; lemmas hairy, 4-nerved.

Flowering July to March. Disturbed areas or wet places. Infrequent. Naturalized from Australia. Biome: Fynbos and Savanna. Weed (of cultivation).

Description: Smook & Stirton 1979 (637). Voucher: Van der Walt 398. PRECIS code 9902430–00050.

*Agrostis barbuligera* Stapf var. *barbuligera*

Perennial; tufted; 200–800 mm tall. Leaf blades to 250 mm long; 2–6 mm wide (flat). Spikelets 4.0–5.5 mm long. The basal sheaths splitting into fibres; panicle branches flexuous, spreading at maturity; rachilla produced as a hairy bristle; lemmas awned from near base.

Flowering November to March. Mountain grassland. Infrequent, or locally common. Biome: Grassland. Endemic.

Description: Stapf 1898–1900 (548), Chippindall 1955 (99). Voucher: Acocks 21079. PRECIS code 9902430–00100.

*Agrostis barbuligera* Stapf var. *longipilosa* Goossens & Papendorf

Spikelets 3.0–3.5 mm long. Differs from the typical variety in its smaller spikelets, with more hairy lemmas.

Biome: Grassland. Endemic. Voucher: Van der Schijff 4776. PRECIS code 9902430–00200.

*Agrostis bergiana* Trin. var. *bergiana*

Delicate, weak perennial, or annual; 150–300(–600) mm tall. Leaf blades to 90 mm long; 1–2 mm wide. Spikelets 1.5–2.5 mm long. Panicle very diffuse, the branches hairlike; pedicels 5–10 mm long; paleas present.

Flowering November to February. Mountain grassland in sheltered or wet places. Locally common. Biome: Fynbos and Grassland. Endemic.

Description: Stapf 1898–1900 (547), Chippindall 1955 (101). Voucher: Huntley 422. PRECIS code 9902430–00300.

*Agrostis bergiana* Trin. var. *laevisulca* Stapf

Spikelets 2.5–3.0 mm long. Similar to the typical variety except for the longer spikelets.

Flowering October to February. Wet places in mountain grassland. Rare. Biome: Fynbos, Grassland and Afromontane. Endemic.

Description: Stapf 1898–1900 (547), Chippindall 1955 (102). Voucher: De Winter & Codd 209. PRECIS code 9902430–00400.

*Agrostis continuata* Stapf

(= *A. natalensis* Stapf) 2.

Coarse perennial; tufted; 600–900 mm tall. Leaf blades to 250 mm long; to 6(–8) mm wide. Spikelets about 5 mm long. Inflorescence dense, narrow and spikelike, the spikelets overlapping.

Flowering December to April. Vlei grassland and wet places, sometimes at high altitudes. Biome: Savanna and Grassland. North to Tanzania. The spikelike panicle resembles *Phalaris arundinacea*, which has no awns, and *Koeleria capensis*, which has 2–4-flowered spikelets.

Description: Stapf 1898–1900 (548), Chippindall 1955 (99), Clayton et al. 1970–1982 (111). Illustration: Chippindall 1955 (fig. 70). Voucher: Pole-Evans 1968. PRECIS code 9902430–00450.

*Agrostis eriantha* Hack. var. *eriantha*

Fig. 12. Pl. 3.

Perennial; rhizomatous and tufted; to 700 mm tall. Leaf blades to 180 mm long; 1–2 mm wide (folded). Spikelets 3.5–5.0 mm long. Panicle branches rigid, straight, held ascending at maturity; rachillas not produced; lemmas awned from the middle.

Flowering January to April. Wet places, sometimes in disturbed areas or cultivation. Infrequent. Biome: Savanna and Grassland. ?Endemic. Includes var. *planifolia*, which possibly has flat leaf blades and slightly longer callus hairs.

Description: Chippindall 1955 (99). Illustration: Chippindall 1955 (fig. 71). Voucher: Potter 1745. PRECIS code 9902430–00500.

*Agrostis eriantha* Hack. var. *planifolia* Goossens & Papendorf

Doubtfully separate from the typical variety, but with flat leaf blades and somewhat longer callus hairs.

Biome: Savanna. ?Endemic. PRECIS code 9902430–00600.

*Agrostis gigantea* Roth

Perennial; usually stoloniferous (culms decumbent); 400–750 mm tall. Leaf blades to 90 mm long; 3–5 mm wide. Spikelets 1.5–2.5 mm long. Panicle open, 70–200 mm long, the branches ascending; rachilla not produced; lemmas glabrous.

Wet disturbed places. Infrequent. ? Naturalized from Europe. Biome: Fynbos and Savanna. This name is applied to our specimens by matching at Kew; probably related to *A. schimperiana* of east Africa.

Voucher: Burtt Davy 9233. PRECIS code 9902430–00650.

*Agrostis lachnantha* Nees var. *lachnantha*

(= *A. huttoniae* (Hack.) C.E. Hubb.) 2; (= *A. lachnantha* Nees var. *glabra* Goossens & Papendorf).

South African bent grass, vinkagrostis.

Shortlived perennial, or an-



nual (usually robust); loosely tufted; 300–900 mm tall. Leaf blades 70–200 mm long; 2–4 mm wide. Spikelets 1.5–2.5(–3.0) mm long. Panicle 150–400 mm long, narrow and sinuous, the branches held nearly erect.

Flowering October to March (occasionally earlier or later). Riverbanks and wet places. Locally common. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. Northwards through east Africa to Sudan and Ethiopia. One of the most widespread of all our grass species. Var. *glabra* is not considered distinct.

Description: Chippindall & Crook 1976, Stapf 1898–1900 (549), Chippindall 1955 (101), Clayton et al. 1970–1982 (106). Illustration: Chippindall 1955 (fig. 73). Voucher: Oakes & Scheepers 301. PRECIS code 9902430–00900.

***Agrostis montevidensis* Spreng. ex Nees**

Fog grass.

Annual; 200–600 mm tall. Leaf blades to 130 mm long; 1–2 mm wide. Spikelets 1.5–2.5 mm long. Panicle very diffuse, the branches hairlike; pedicels 20 mm long or more; paleas absent.

Flowering November to April. Moist and disturbed places in mountain grassland. Rare. Naturalized from South America. Biome: Fynbos and Grassland. Weed.

Description: Smook & Stirton 1979 (637). Voucher: Story 5438. PRECIS code 9902430–01050.

***Agrostis polypogonoides* Stapf**

Perennial; tufted; to 750 mm tall. Leaf blades to 120 mm long; 3–4 mm wide. Spikelets 4.0–4.5 mm long. Glumes with an awn 1–3 mm long.

Flowering October to January. Wet places. Rare. Biome: Fynbos and Succulent Karoo. Endemic. This is our only *Agrostis* species with awned glumes.

Description: Stapf 1898–1900 (549), Chippindall 1955 (98). Voucher: Acocks 17581. PRECIS code 9902430–01200.

***Agrostis schlechteri* Rendle**

Annual; 30–650 mm tall. Leaf blades to 100 mm long; 2.0–2.5 mm wide. Spikelets 3.0–3.5 mm long. Panicle open, 90–150 mm long, the branches ascending; rachilla 1/2–3/4 the length of the floret; lemmas glabrous.

Flowering January to April. Wet places in mountains. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (762), Chippindall 1955 (101). Voucher: Esterhuysen 27690. PRECIS code 9902430–01300.

***Agrostis subulifolia* Stapf**

Delicate perennial, or annual (possibly); hydrophyte and tufted; 50–300 mm tall. Leaf blades to 70 mm long; 0.5–1.0 mm wide (folded). Spikelets 2–3 mm long. Panicle contracted to open, 15–80 mm long, the branches ascending; rachilla not produced; lemmas glabrous.

Flowering January to March. Mountain bogs. Infrequent. Biome: Grassland and Afrotropical. Endemic.

Description: Chippindall 1955 (102). Voucher: Coetzee 574. PRECIS code 9902430–01400.

Aira L.

Airella (Dumort.) Dumort., *Aspris* Adans., *Caryophyllea* Opiz, *Fiorinia* Parl., *Fussia* Schur, *Salmasia* Bub.

Annual; caespitose (small, slender). Culms 20–400 mm high; herbaceous; unbranched above. Leaf blades linear; setaceous; flat, or folded, or rolled. Ligule an unfripped membrane.



Fig. 13. *Aira cupaniana*

Inflorescence paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 1.6–3.5 mm long; compressed laterally; disarticulating above the glumes. *Rachilla hairless*. Glumes two; more or less equal; *about equalling the spikelets*; awnless; similar (membranous, delicate). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 2. Lemmas *decidedly firmer than the glumes (becoming papery)*; 5 nerved; entire, or incised; awnless, or awned. Awns when present 1; dorsal; geniculate; much shorter than the body of the lemma, or about as long as the body of the lemma, or much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; fusiform; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. 8 species. North and South temperate. Mesophytic to xerophytic; in open habitats (sandy soils). Orange Free State, Natal, Lesotho, and Cape Province. 1 naturalized species.

References. 1. Clayton. 1972. FWTA. 2. Tutin. 1980. Fl. Europ.

Species treatment by T.M. Sokutu.

Aira cupaniana Guss.

Fig. 13. Pl. 4.

Annual; tufted; 30–400 mm tall. Leaf blades 10–95 mm long; to 3 mm wide. Spikelets 2–3 mm long. Inflorescence open, spreading; spikelets 2-flowered; glumes pear-shaped; lemmas awned from the lower third, lower lemma sometimes awnless.

Flowering September to January. Shallow soils in damp to wet areas. Common. Naturalized from Europe. Biome: Fynbos and Grassland. Europe. Weed. A variable species. See Clayton (1970) for a comment on the intermediate state of the African material. In the past our specimens were assigned to two species, *A. cupaniana* and *A. caryophylla* L. They are treated here under *A. cupaniana* pending further research and confirmation of their identities. The species can be confused with *Periballia minuta*, last collected at Simonstown in 1943, but this genus has an elongated internode between the florets.

Description: Tutin 1980 (5: 227). Stapf 1898–1900 (463). Chippindall 1955 (86). Clayton et al. 1970–1982 (84). Illustration: Chippindall 1955 (fig. 57). Voucher: Davidse 33862. PRECIS code 9901850–00100.

Alloteropsis Presl

Bluffia Nees, *Coridochloa* Nees, *Holoseium* Steud., *Mezochloa* Butzin, *Pterochlaena* Chiov.

Annual (rarely), or perennial; caespitose, or decumbent. Culms 200–1500 mm high; herbaceous; unbranched above. Leaf blades linear to lanceolate. *Ligule a fringed membrane to a fringe of hairs*.

Inflorescence of spike-like main branches; digitate or subdigitate, or non-digitate (in whorls on a short central axis); espatheate. *Spikelet-bearing axes persistent*.

Spikelets in triplets, or in pairs; consistently in 'long-and-short' combinations. Spikelets 2.5–7 mm long; *abaxial*; compressed dorsiventrally; falling with the glumes. Glumes two; very unequal; awned, or awnless; very dissimilar (G1 smaller, thinner, often mucronulate; G2 densely ciliate). *Lower glume 3–5 nerved*. *Proximal incomplete florets 1*; paleate, palea reduced (deeply bifid, 1-nerved); male.

Female-fertile florets 1. Lemmas *similar in texture to the glumes*; smooth to striate; not becoming indurated; hairless; having the margins lying flat and exposed on the palea; with a clear germination flap; 5 nerved (1–3 in '*Mezochloa*'); entire; mucronate to awned. Awns when present 1; apical; non-geniculate; much shorter than the body of the lemma to about as long as the body of the lemma. Palea present (auriculate at base); relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.



Fig. 14. *Alloteropsis semialata* subsp. *semialata*

Photosynthetic pathway. C_4 (in all the material examined except *A. semialata* subspecies *eckloniana*, including '*Coridochloa*'), or C_3 (*A. semialata* subspecies *eckloniana*). The anatomical organization when C_4 unconventional. Organization of PCR tissue when C_4 *Alloteropsis* type (with an inner PCR sheath, and an outer sparsely chlorenchymatous sheath of unknown function). Biochemical type PCK (in Australian C_4 *A. semialata*), or NADP-ME (in southern African C_4 *A. semialata*; evidently more biochemical typing needed, in relation to the intergrading C_4 anatomical forms and the problematical taxonomy); $XyMS+$ (usually), or $XyMS-$ (in C_4 forms of *A. semialata*). PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicoideae; Paniceae. 5–8 species (with complexes around *A. semialata* and *A. paniculata* reflecting specific and generic synonymys). Tropical Africa, Asia & Australia. Helophytic, or mesophytic, or xerophytic; in open habitats (marshy and weedy places); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. 3 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA. 2. Gibbs Russell. 1983. Bothalia 14: 205.

Species treatment by G.E. Gibbs Russell.

- 1(0). Spikelets 5–8 mm long; palea of upper floret glabrous or with sparse hairs; leaf blades linear to lanceolate, bases tapering, margins not ciliate; culms thickly clad by old leaf sheaths at base 2
Spikelets 3.0–4.5 mm long; palea of upper floret papillose; leaf blades lanceolate, bases cordate to auriculate, margins ciliate; culm bases not thickly clad by old leaf sheaths 3
- 2(1). Leaf blades rolled or curved upwards, tapering gradually to tip, sparsely hairy, linear, hard-textured; old leaf sheaths at base of culms with veins forming ribs 0.5–1.1 mm wide; racemes often (but not always) longer than 80 mm, usually with light-coloured spikelets loosely arranged
..... *A. semialata* subsp. *semialata*
Leaf blades held flat, tapering abruptly to tip, densely hairy, lanceolate, rather soft-textured; old leaf sheaths at base of culms with veins to 0.3 mm wide; racemes often (but not always) shorter than 80 mm, usually with dark-coloured spikelets tightly packed together . *A. semialata* subsp. *eckloniana*
- 3(1). Plant annual; culms often geniculate at base; northern Namibia and Botswana *A. cimicina*
Plant perennial; culms erect from a knotted base; eastern Transvaal and Natal *A. papillosa*

Alloteropsis cimicina (L.) Stapf

Annual; tufted (culms erect or ascending); 300–1000 mm tall. Leaf blades 30–150 mm long (bases rounded, margins ciliate); 5–10 mm wide. Spikelets 3.5–5.5 mm long. Palea with globular hairs.

Flowering December to May. Moist open places on sandy clay soil. Rare (in southern Africa). Biome: Savanna. Old world tropics.

Description: Clayton et al. 1970–1982 (615). Illustration: Clayton et al. 1970–1982 (fig. 144). Voucher: Killick & Leistner 3027. PRECIS code 9900940–00100.



Alloteropsis papillosa Clayton

Perennial; tufted; 400–700 mm tall. Leaf blades 40–250 mm long (bases rounded to auriculate, margins ciliate); 2–8 mm wide. Spikelets 3.0–4.5 mm long. Culm bases knotted, with a few hairy old leaf sheaths; palea with globular hairs.

Flowering November to May. Sandy soil in open or shaded habitats. Biome: Savanna. To tropical east Africa. Combines the perennial habit and longer leaves of *A. semialata* with the ciliate blade margins and papillate palea of *A. cimicina*. Possibly of hybrid origin.

Description: Clayton et al. 1970–1982 (615). Voucher: Ward 4140. PRECIS code 9900940–00150.



Alloteropsis semialata (R. Br.) Hitchc. subsp. *eckloniana* (Nees) Gibbs Russell

Fig. 14. Pl. 5. Pl. 6.

(=*A. semialata* auctt., non Gibbs Russell) 2; (=*A. semialata* (R. Br.) Hitchc. var. *ecklonii* (Stapf) Stapf) 2.

Perennial; short-rhizomatous and tufted; 250–1100 mm tall. Leaf blades 3–12 mm wide (flat, base tapering, tip tapering abruptly, velvety to sparsely hairy, margins not ciliate). Spikelets 5–8 mm long. Basal parts V-shaped in silhouette, not bulbous; basal sheaths with veins to 0.3 mm wide; racemes often shorter than 80 mm, with dark-coloured spikelets tightly packed; palea glabrous or with sparse hairs.

Flowering September to March (sometimes in other months). Grassland, rocky places and forest margins; usually at higher altitudes and more acid soil than subsp. *semialata*. Common. Biome: Savanna and Grassland. North to Tanzania at high altitudes. Natural pasture. This subspecies is unusual in the Paniceae because it has C_3 photosynthesis.

Description: Gibbs Russell 1983 (205), Chippindall 1955 (423). Illustration: Chippindall 1955 (fig. 352). Voucher: Smook 2586. PRECIS code 9900940–00200.



Alloteropsis semialata (R. Br.) Hitchc. subsp. *semialata*

(=*A. semialata* auctt., non Gibbs Russell) 2.

Perennial; short-rhizomatous and tufted; 300–1300(–1500) mm tall. Leaf blades 3–5(–6) mm wide (usually curved inward or loosely rolled, sparsely hairy, base tapering, tip gradually tapering, margins not ciliate). Basal parts bulbous, rounded in silhouette; basal sheaths with ribs 0.5–1.1 mm wide; racemes often longer than 80 mm, with light-coloured spikelets loosely arranged; palea glabrous or with sparse hairs.

Flowering September to March. Grasslands and bushveld. Common. Biome: Savanna and Grassland. Old world tropics. Natural pasture. *A. semialata* is most unusual in having two photosynthetic types in one species. This is the subspecies with C_4 photosynthesis.

Description: Chippindall 1955 (423), Clayton et al. 1970–1982 (616). Voucher: Van der Schijff 2035. PRECIS code 9900940–00250.



Ammophila Host

Psamma P. Beauv.

Perennial; long-rhizomatous. Culms 200–1300 mm high; herbaceous; unbranched above. Leaf blades linear; rolled (convolute). *Ligule an unfringed membrane.*

Inflorescence paniculate; contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 9–15 mm long; compressed laterally; disarticulating above the glumes. Hairy callus present. Glumes two; more or less equal; long relative to the adjacent lemmas (longer); awnless; similar. All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas similar in texture to the glumes; 5 nerved; entire, or incised; mucronate (with a subterminal, vestigial awn). Palea present; relatively long. Lodicules 2; membranous; ciliate, or glabrous. Stamens 3. Ovary glabrous. Fruit medium sized; hilum long-linear (two thirds of fruit length); embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Pooideae; Aveneae. 2 species. North temperate. Commonly adventive. Xerophytic; in open habitats; maritime-arenicolous. Cape Province. 1 naturalized species.

A. arenaria hybridizes with *Calamagrostis epigejos* (*X Ammocalamagrostis* P. Fourn., a useful sand stabilizer).

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by G.E. Gibbs Russell.



Fig. 15. *Ammophila arenaria*

Ammophila arenaria (L.) Link

Marram grass.

Robust perennial; rhizomatous and tufted (the culms creeping through blown sand); 600–1300 mm tall. Leaf blades rolled and appearing setaceous, to 750 mm long. Panicle very narrow and spikelike.

Flowering October to December (old inflorescences persistent until autumn). Seaside dunes. Naturalized from Europe. Widely naturalized. Erosion control (in seaside dunes).

Description: Chippindall 1955 (93). Illustration: Chippindall 1955 (fig. 65). Voucher: Liebenberg 4024. PRECIS code 9902560–00100.

Andropogon L.

Anatherum P. Beauv., *Arthrostachys* Desv., *Arthrolophus* (Trin.) Chiov., *Diectomis* Kunth, *Dimeiosemon* Raf., *Eriopodium* Hochst., *Heterochloa* Desv., *Homoeatherum* Nees, *Leptopogon* Roberty.

Annual, or perennial; long-rhizomatous, or caespitose, or decumbent. Culms 80–2500(–4300) mm high; herbaceous; branched above, or unbranched above. *The shoots not aromatic.* Leaf blades linear. *Ligule an unfringed membrane to a fringed membrane.* Plants bisexual, with bisexual spikelets. *The spikelets of sexually distinct forms on the same plant; overtly heteromorphic.*

Inflorescence of spike-like main branches, or paniculate (usually with spikelets in paired or digitate 'racemes', which are often spatheate and aggregated into false panicles); spatheate (usually); a complex of 'partial inflorescences' and intervening foliar organs (often), or not so. Spikelet-bearing axes 'racemes'; paired (rarely one or several, not deflexed); with very slender rachides, or with substantial rachides; disarticulating at the joints. 'Articles' without a basal callus-knob.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only, or barren, usually awnless, occasionally suppressed (sometimes reduced to their pedicels). Female-fertile spikelets compressed laterally, or not noticeably compressed, or compressed dorsiventrally; falling with the glumes. *Callus blunt.* Glumes two; more or less equal; awned, or awnless (upper sometimes aristate); very dissimilar (subcoriaceous to membranous, the lower flat, concave or canaliculate on the back, the margins folded and 2-keeled; the upper naviculate, carinate above). *Lower glume two-keeled. Proximal incomplete florets 1; epaleate; sterile.*

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline to firm, sometimes substipitate beneath the awn); incised (usually bifid); awned. Awns 1; median; from the sinus; geniculate; about as long as the body of the lemma to much longer than the body of the lemma. Palea present; very reduced (hyaline). Lodicules 2; fleshy; ciliate, or glabrous. Stamens 1–3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. About 100 species. Tropical. Mesophytic, or xerophytic; mostly savanna, some in tropical highlands. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 15 indigenous species.

References. 1. Anderson 1960. Bothalia 7: 417. 2. Clayton. 1964. Kew Bull. 17: 470. 3. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Fig. 15. Pl. 7.



- 1(0). Plants annual, reddish, with numerous flowering branches; racemes 1 per spathe; lower glume of pedicellate spikelets large, flat, papery, reddish, with an awn 5–7 mm long **A. fastigiatus**
Plants perennial, not reddish; flowering branches 1–8 per culm; racemes more than 1 per spathe; lower glume of pedicellate spikelets not as above 2
- 2(1). Glumes with irregular pits between the veins **A. lacunosus**
Glumes lacking pits between the veins 3
- 3(2). Inflorescence white silky plumose; hairs at least as long as sessile spikelets; pedicellate spikelets usually conspicuously reduced or lacking 4
Inflorescence not white silky plumose; hairs if present not longer than sessile spikelets; pedicellate spikelets not conspicuously reduced 6
- 4(3). Sessile spikelets 2–3 mm long; pedicellate spikelets lacking; inflorescence hairs at least twice as long as spikelets **A. eucomus**
Sessile spikelets 4.5–6.0 mm long; pedicellate spikelets reduced; inflorescence hairs as long as sessile spikelets 5
- 5(4). Racemes 4–10 per spathe; pedicellate spikelets well-developed or variously reduced; plants 800–1800 mm tall **A. huillensis**
Racemes 2–3 per spathe; pedicellate spikelets reduced or suppressed; plants 300–900 mm tall **A. laxatus**
- 6(3). Lower glume of sessile spikelets with hairs longer than 1 mm on the back **A. amethystinus**
Lower glume of sessile spikelets glabrous or sometimes hispid on the back, rarely with a few hairs to 1 mm long 7
- 7(6). Basal sheaths compressed and keeled, plant bases often flattened; inflorescence rachises and pedicels linear and rounded, not or only slightly broadened at the upper end (or narrowly clavate in *A. appendiculatus*) 8
Basal sheaths not keeled and plant bases not flattened; inflorescence rachises often flattened, broadening upwards so that widest part is just below the spikelet 11
- 8(7). Sessile spikelets 0.5–0.8 mm wide; inflorescences hairless or nearly so, sometimes with a few hairs at upper ends of pedicels 9
Sessile spikelets (0.7–)0.9–1.1 mm wide; inflorescences hairy on callus, rachis and pedicels 10
- 9(8). Racemes 1–2 per spathe, short and straight, awnless; spikelets 4.0–4.5 mm long, glumes glabrous; Natal **A. festuciformis**
Racemes 4–15 per spathe, long and flexuous, short-awned; spikelets 5.5–7.0 mm long, lower glume of sessile spikelets with appressed stiff hairs on keels; Namibia and Botswana **A. brazzae**
- 10(8). Racemes 2–3 per spathe, 25–60 mm long; callus of sessile spikelets inserted in a tuft of hairs; Transvaal mountain grasslands **A. mannii**
Racemes 2–20 per spathe, (30–)60–150 mm long; callus of sessile spikelets (sometimes hairy) inserted in a membranous-edged socket; widespread distribution, various habitats **A. appendiculatus**
- 11(7). Lower glume of sessile spikelets flat or shallowly furrowed, keels lateral, backs sometimes with short hairs or glabrous 12
Lower glume of sessile spikelets deeply grooved, keels dorsal and sometimes nearly meeting, backs glabrous 13
- 12(11). Lower glume of sessile spikelets wingless, back flat with a narrow median furrow, tip not toothed, not awned; bushveld . **A. gayanus** var. **polycladus**
Lower glume of sessile spikelets winged at edge in upper end, back flat, tip 2-toothed, often awned between teeth; mountain grassland **A. distachyos**

- 13(11). Upper glume of sessile spikelets with awn 7–10 mm long, and both glumes of pedicellate spikelets with awns 4–7 mm long **A. chinensis**
All glumes awnless or lower glume of pedicellate spikelets with a minute awn to 2 mm long . . 14
- 14(13). Inflorescence of 2–20 racemes, dark purple-tinged; lemma awn 10–15 mm long; damp or shady habitats **A. appendiculatus**
Inflorescence of 2(–5) racemes, glaucous green or reddish; lemma awn 15–30 mm long; open habitats on hills and mountains 15
- 15(14). Sessile spikelets 7–9 mm long, keels of lower glume held separated, callus broadly obtuse; basal parts and rhizomes knotted; inflorescences glaucous grey or green; mountain sourveld . . . **A. ravus**
Sessile spikelets 5–7 mm long, keels of lower glume nearly meeting, callus obtuse to subacute; basal parts and rhizomes straight; inflorescences usually reddish-tinged; various habitats **A. schirensis**



Fig. 16. *Andropogon chinensis*

Andropogon amethystinus Steud.

(= *A. abyssinicus* sensu Chippind., non Fresen.) 3; (= *A. pilosellus* Stapf) 3.

Perennial; rhizomatous and tufted; 80–700 mm tall. Leaf blades 10–150 mm long; 1–4 mm wide. Spikelets (sessile) 5.0–8.5 mm long (pedicellate slightly shorter). Racemes 2 per spathe, pedicels linear or slightly clavate; lower glume of sessile spikelets flat on the back, with hairs longer than 1 mm, but inflorescence not plumose.

Flowering February to June. Mountain grassland. Locally common. Biome: Afromontane. Tropical Africa and India. *A. abyssinicus* Fresen., a closely-related annual, does not occur in southern Africa. Our specimens previously included in this species are perennial and thus belong in *A. amethystinus*.

Description: Chippindall 1955 (496), Clayton et al. 1970–1982 (772). Voucher: Edwards 2819. PRECIS code 9900710–00150.

**Andropogon appendiculatus** Nees

Blougras.

Perennial; densely tufted; 300–1300 mm tall. Leaf blades 150–500 mm long; to 6 mm wide. Spikelets (sessile and pedicellate) 5–7 mm long; (0.7–)0.9–1.2 mm wide. Basal sheaths keeled, flattened, yellow, becoming brown, shining; inflorescence of 1–2 flowering branches per culm, racemes 4–20 per spathe, (30–)60–150 mm long, dark purple, with short hairs, pedicels rounded, slightly clavate; callus of sessile spikelets inserted in a membranous-edged socket, lower glume deeply but broadly grooved; lemma awn 10–15 mm long.

Flowering October to April. Wet or shady places. Common. Biome: Fynbos, Savanna, and Grassland. Southern Africa. A widespread variable species best distinguished by the flattened basal parts and deeply but widely grooved lower glumes of the sessile spikelets. Individuals with particularly hairy racemes may be mistaken for *A. huillensis*, which has 5–7 flowering branches per culm.

Description: Chippindall 1955 (500). Illustration: Chippindall 1955 (fig. 403). Voucher: Huntley 456. PRECIS code 9900710–00200.

**Andropogon brazzae** Franch.

Perennial; rhizomatous; to 2000 mm tall. Leaf blades to 600 mm long; to 5 mm wide. Spikelets (sessile and pedicellate) 5.5–7.0 mm long; 0.6–0.8 mm wide. Basal sheaths keeled, flattened; inflorescence nearly glabrous, racemes 4–15 per spathe, long, slender and flexuous, pedicels linear, rounded or slightly clavate; lower glume of sessile spikelets shallowly concave.

Flowering February to May. Beside permanent rivers. Rare and conservation status not known. Biome: Savanna. To Angola and Zaire.

Voucher: Smith 2685. PRECIS code 9900710–00300.

**Andropogon chinensis** (Nees) Merr.

Fig. 16. Pl. 8.

(= *A. schinzii* Hack.) 3.

Hairy bluegrass, tweevinger-gras.

Perennial; densely tufted; 600–1200 mm tall. Leaf blades 100–400 mm long; to 8 mm wide. Spikelets (sessile) 5–7 mm long (pedicellate somewhat shorter). Plant glaucous grey, reddish tinged; base slightly bulbous; culms branched; racemes 2–3 per spathe, pedicels cuneate; lower glume of sessile spikelets deeply and narrowly grooved, upper glume awned, both glumes of pedicellate spikelets with an awn 4–7 mm long.

Flowering December to June. Rocky hillsides and often in poor sandy soil. Common. Biome: Savanna, Grassland, and Nama-Karoo. Throughout tropical Africa and Asia to China.

Description: Chippindall 1955 (499), Clayton et al. 1970–1982 (779). Illustration: Clayton et al. 1970–1982 (fig. 180.3). Voucher: De Winter & Leistner 5487. PRECIS code 9900710–00350.

**Andropogon distachyos** L.

Mountain andropogon, tweevingergras.

Perennial; rhizomatous and tufted; 300–1000 mm tall. Leaf blades 70–200 mm long; 2–4 mm wide. Spikelets (sessile) 9–11 mm long (pedicellate shorter). Plant base with silky hairs; racemes 2 per spathe, pedicels stout, slightly clavate; lower glume of sessile spikelets flat on back, broadly winged on upper 1/3, tip bidentate, often awned.

Flowering January to June. Mountain grassland. Infrequent. Biome: Afromontane. Throughout tropical Africa to Asia.

Description: Chippindall 1955 (496), Clayton et al. 1970–1982 (770). Illustration: Clayton et al. 1970–1982 (fig. 180.1). Voucher: Edwards 2006. PRECIS code 9900710–00400.

**Andropogon eucomus** Nees

Snowflake grass, kapokgras, old man's beard, silver thread grass.

Perennial; densely tufted; 200–900 mm tall. Leaf blades 40–200 mm long; to 4 mm wide. Spikelets 2–3 mm long (all sessile, accompanied by a hairy empty pedicel). Inflorescence plumose, of 2–6 flowering branches; racemes 2–5 per spathe, with white silky hairs twice as long as the spikelets; lower glume of sessile spikelets deeply and narrowly grooved.

Flowering November to May. Vleis and wet places. Common. Biome: Fynbos, Savanna, and Grassland. Tropical Africa and Madagascar. Closely related to *A. huillensis* and *A. laxatus*, which both have larger spikelets.

Description: Chippindall 1955 (502), Clayton et al. 1970–1982 (775). Illustration: Chippindall 1955 (fig. 404). Voucher: Louw 870. PRECIS code 9900710–00500.



Andropogon fastigiatus Swartz

(=*Diectomis fastigiata*
(Swartz) Kunth) 3.



Annual; tufted; 300–500 mm tall. Leaf blades 50–300 mm long; 1–4 mm wide. Spikelets (sessile) 4–5 mm long (pedicellate longer and wider). Plants reddish brown; inflorescences with numerous flowering branches per culm; racemes solitary in spathes; lower glume of sessile spikelet very deeply and narrowly grooved, lower glume of pedicellate spikelet large, flat, papery, reddish, with an awn 5–7 mm long.

Flowering April to May. Dry sandy soil. Rare and conservation status not known. Locally common. Biome: Savanna. Throughout tropics. *Monocymbium ceresiiforme* also has solitary spatheate racemes, but that is a perennial species with wider leaf blades and shorter spikelets.

Description: Chippindall 1955 (504), Clayton et al. 1970–1982 (777). Illustration: Chippindall 1955 (fig. 405). Voucher: Codd 4029. PRECIS code 9900710–00600.

Andropogon festuciformis Rendle

(=*Hypogynium schlechteri*
(Hack.) Pilg.) 2.



Perennial; densely tufted; 160–1000 mm tall. Leaf blades 50–300 mm long; 1.5–3.0 mm wide. Spikelets (sessile) 4.0–4.5 mm long (pedicellate larger); 0.5–0.8 mm wide. Basal sheaths keeled, flattened; inflorescence glabrous, racemes 1–2 per spathe, awnless, short, pedicels linear, rounded; lower glume of sessile spikelets flattish.

Flowering July to January. Moist places. Infrequent. Southern tropical Africa.

Description: Chippindall 1955 (516). Illustration: Chippindall 1955 (fig. 412). Voucher: Wood 8543. PRECIS code 9900710–00700.

Andropogon gayanus Kunth var. **polycladus** (Hack.) Clayton

(=*A. gayanus* Kunth var.
squamulatus (Hochst.) Stapf) 3.



Rhodesian bluegrass, Rhodesian andropogon.

Robust perennial; tufted; culms branched, 1200–3600 mm tall. Leaf blades to 600 mm long; 5–20 mm wide (in the middle, base narrow). Spikelets (sessile) 6.0–7.5 mm long (pedicellate a little shorter). Plant glaucous; racemes 2 per spathe, pedicels cuneate; lower glume of sessile spikelet broad, flattish but with a narrow central furrow; lower or both glumes of pedicellate spikelet with awns to 10 mm.

Flowering December to June. Bushveld. Common. Biome: Savanna. Tropical Africa.

Description: Chippindall 1955 (499), Clayton et al. 1970–1982 (777). Illustration: Chippindall 1955 (fig. 402), Clayton et al. 1970–1982 (fig. 180.4). Voucher: De Winter & Marais 4827. PRECIS code 9900710–00820.

Andropogon huillensis Rendle

Grootwitbaardandropogon,
rietgras, large silver andropogon.



Perennial; tufted; 900–1800 mm tall. Leaf blades 80–400 mm long; 2–4 mm wide. Spikelets (sessile) 4–5 mm long (pedicellate sometimes slightly longer, but usually reduced). Inflorescence plumose, with 5–7 flowering branches per culm; racemes 4–10 per spathe, with white silky hairs as long as the sessile spikelet; lower glume of sessile spikelets deeply and broadly grooved.

Flowering September to June (but usually in autumn). Wet places, usually on sand. Common. Biome: Savanna and Grassland. Southern tropical Africa. Closely related to *A. eucomus* and *A. laxatus*, which are smaller and have suppressed pedicellate spikelets.

Description: Chippindall 1955 (500). Voucher: Repton 4058. PRECIS code 9900710–00900.

Andropogon lacunosus J.G. Anders.

Perennial; straggling; 300–600 mm tall. Leaf blades 80–150 mm long; 2–5 mm wide. Spikelets (sessile) 5–7 mm long (pedicellate longer). Racemes 2–3, pedicels linear; lower glume of sessile spikelets broadly rounded on either side of a deep central furrow, pitted between veins.

Flowering November to April. Swampy places at high altitudes. Infrequent. Scattered in tropical Africa. Related to *A. distachyos*, which lacks the glume pits.

Description: Clayton et al. 1970–1982 (770). Voucher: Codd 6441. PRECIS code 9900710–01000.

**Andropogon laxatus** Stapf

Perennial; tufted; 300–900 mm tall. Leaf blades 20–200 mm long; 2–3 mm wide. Spikelets (sessile) 4–6 mm long (pedicellate reduced or suppressed). Inflorescence plumose; racemes 2–3 per spathe, with white silky hairs as long as the sessile spikelets; lower glume of sessile spikelets deeply and broadly grooved.

Flowering October to March. Wet places. Rare and conservation status not known. Tropical Africa. Closely related to *A. eucomus*, which has smaller spikelets, and *A. huillensis*, which is a larger plant with more racemes.

Description: Chippindall 1955 (501), Clayton et al. 1970–1982 (775). Illustration: Clayton et al. 1970–1982 (fig. 180.2). Voucher: De Winter & Codd 218. PRECIS code 9900710–01100.

**Andropogon mannii** Hook. f.

(=*A. platybasis* J.G.
Anders.) 3.

Perennial; densely tufted; 100–600 mm tall. Leaf blades 20–250 mm long; 2–8 mm wide. Spikelets (sessile) 4.5–8.0 mm long (pedicellate equalling it or slightly longer); 0.9–1.1 mm wide. Basal sheaths keeled, flattened; inflorescence with



short hairs; racemes 2–3 per spathe, 25–60 mm long, pedicels linear, rounded; lower glume of sessile spikelets shallowly concave below.

Flowering October to December. Mountain grassland in moist places. Rare and conservation status not known. Biome: Afromontane. Tropical Africa. The species is variable over its range, with the forms on the disjunct highland areas all differing slightly.

Description: Clayton et al. 1970–1982 (774). Voucher: De Winter & Codd 199. PRECIS code 9900710–01250.

***Andropogon ravus* J.G. Anders.**

Perennial; rhizomatous (rhizomes branched, knotted); 150–900 mm tall. Leaf blades to 300 mm long; 2–7 mm wide. Spikelets (sessile) 7–9 mm long (pedicellate considerably longer). Plant glaucous grey; racemes 2(–3), pedicels cuneate-clavate; lower glume of sessile spikelets deeply grooved, glumes unawned; lemma awn 15–20 mm long.



Flowering January to March. Mountain sourveld. Locally common. Biome: Afromontane. Southern Africa. Only doubtfully distinct from *A. schirensis*, with which it intergrades.

Voucher: Killick 1261. PRECIS code 9900710–01400.

***Andropogon schirensis* A. Rich.**

(=*A. schirensis* A. Rich. var. *angustifolius* Stapf) 3.

Gesteektegras.

Perennial; densely tufted; 600–1200 mm tall. Leaf blades 90–600 mm long; 3–14 mm wide. Spikelets (sessile) 5–7 mm long (pedicellate slightly longer). Plant reddish; racemes 2(–5), pedicels clavate; lower glume of sessile spikelets deeply and very narrowly grooved, glumes unawned; lemma awn 25–30 mm long.



Flowering December to April. Open veld and rocky hillsides. Common. Biome: Savanna and Grassland. Tropical Africa. Closely related to *Diheteropogon amplexans*, which has very similar sessile spikelets, but is distinguished by the rounded leaf blade bases.

Description: Chippindall 1955 (497), Clayton et al. 1970–1982 (779). Voucher: Feely, Tinley & Ward 3. PRECIS code 9900710–01600.

***Antheophora* Schreber**

Hypudaerus A. Br.

Annual, or perennial; long-rhizomatous, or caespitose to decumbent. Culms 150–1500 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear to lanceolate; flat, or rolled. Ligule an unfringed membrane, or a fringed membrane. *Plants bisexual, with bisexual spikelets*. The spikelets of sexually distinct forms on the same plant (the glomerules comprising 1–3 central perfect spikelets with two or more outer, male, modified involucre spikelets).

Inflorescence a false spike, with clusters of spikelets on reduced axes (3–11 spikelets per glomerule); espatheate. Spikelet-bearing axes disarticulating (the glomerules being reduced branches); falling entire (i.e. each glomerule falling from the persistent main axis).

Spikelets associated with bractform involucre (these consisting of the leathery, expanded lower glumes of the outer, involucre spikelets). The outer, involucre spikelets of each glomerule are male-only, with a broad leathery 2–15 nerved G_1 and a setaceous G_2 . Female-fertile spikelets compressed dorsiventrally; falling with the glumes. *Glumes* two; very unequal, or more or less equal; *awned*; very dissimilar. *Proximal incomplete florets* 1; epaleate; sterile.

Female-fertile florets 1. Lemmas not becoming indurated (membranous); hairless; having the margins lying flat and exposed on the palea; with a clear germination flap, or without a germination flap; 3–5 nerved; entire; awnless. Palea present; relatively long. Stamens 3. Ovary glabrous. Hilum short.

Photosynthetic pathway. C_4 . The anatomical organization usually conventional, or unconventional (rarely, doubtfully). Organization of PCR tissue when unconventional, supposedly *Arundinella* type (see W.V. Brown 1977, quoting Johnson 1965). XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicoideae; Paniceae. 12 species. Tropical and southern Africa, Arabia, tropical

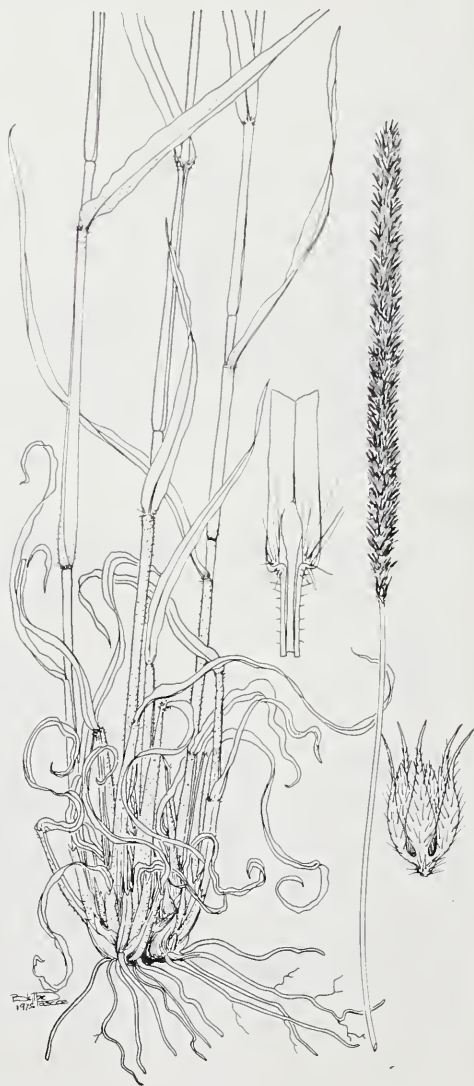


Fig. 17. *Antheophora pubescens*

America. Mesophytic to xerophytic; in open habitats (in dry, sandy savanna); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, and Cape Province. 4 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by H.M. Anderson.

- 1(0). Plants annual; lower glume 7–13-nerved (rarely 5-nerved), with a distinct convex lower half, constricted and curving outwards above **A. schinzii**
Plants perennial; lower glume 2–5-nerved, without a distinct convex lower half, not constricted and curving outwards above 2
- 2(1). Culms profusely branched; spikelets sparsely hairy **A. ramosa**
Culms unbranched or only sparsely branched; spikelets sparsely to densely hairy 3
- 3(2). Leaves blue-green, rigid, often folded, margins smooth, tips shortly tapering to a stiff point; spikelets 3–6 mm wide, lower glume acute or rarely acuminate **A. argentea**
Leaves green, flat, margins crinkled, tips tapering to a soft point; spikelets 5–10 mm wide, lower glume acuminate or shortly awned **A. pubescens**

***Anthephora argentea* Goossens**

(=*A. angustifolia* Goossens).

Perennial; tufted; to 1000 mm tall. Leaf blades 100–150 mm long; 1–3 mm wide. Spikelets about 6 mm long; 2 mm wide. Culms slender and wiry; leaf blades blue-green, rigid, often folded, tip shortly tapered to stiff point; ligule up to 8 mm long and often split; inflorescence 3–6 mm wide; spikelets covered with hairs; lower glumes acute, rarely acuminate.

Flowering November to April. Sandy soil often on dunes, confined to Kalahari Thornveld. Infrequent. Biome: Savanna and Nama-Karoo. Endemic. Natural pasture (high nutritive value). Often mistaken for *Elionurus muticus*, which has paired spikelets and the rachis of the false spike curls and breaks up at maturity. *A. angustifolia* is here synonymised. Chippindall 1955 (438) already remarked that it was not distinct and differed only from *A. argentea* in having the culms scantily branched.

Description: Muller 1984 (54), Chippindall 1955 (436). Illustration: Muller 1984 (fig. 24), Chippindall 1955 (fig. 363). Voucher: Hansen 3333. PRECIS code 9901380–00200.

***Anthephora pubescens* Nees**

Wool grass; borseltjiegras.

Perennial; tufted; 300–1500 mm tall. Leaf blades 100–150 mm long; 3–5 mm wide. Spikelets about 8 mm long; 3 mm wide. Culms not branched; leaves long-tapering to soft point, often curling; inflorescence straw-coloured or dull purple, 5–10 mm wide; spikelets densely covered with hairs; lower glumes acuminate or shortly awned.

Flowering December to April. Shallow acid sandy soils, often on hillsides. Common. Biome: Savanna, Grassland, and Nama-Karoo. Southern and east Africa to Sudan and



Fig. 17.

Iran. Pasture (may be very palatable, has potential for cultivation). Close to *Tarigidia aequiglumis*, which has a paniculate inflorescence and glumes approximately equal.

Description: Muller 1984 (56), Chippindall 1955 (436). Illustration: Muller 1984 (fig. 25), Chippindall 1955 (fig. 362). Voucher: Smook 4441. PRECIS code 9901380–00300.

***Anthephora ramosa* Goossens**

Pl. 9.

Vertakte borseltjiegras.

Perennial; tufted; to 1200 mm tall. Leaf blades 100–200 mm long; 2–6 mm wide. Spikelets 6–7 mm long; 2–3 mm wide. Plants forming lax tufts up to one meter wide; culms branching profusely from base; inflorescence 10 mm wide; spikelets sparsely hairy; lower glume acute, rarely acuminate.

Flowering February to May. Among rocks on hillsides and ravines. Common. Biome: Nama-Karoo. Endemic. Natural pasture. The characteristic branched habit distinguishes *A. ramosa* from other *Anthephora* species.

Description: Muller 1984 (58), Chippindall 1955 (438). Illustration: Muller 1984 (fig. 26), Chippindall 1955 (fig. 364). Voucher: De Winter 3308. PRECIS code 9901380–00400.

***Anthephora schinzii* Hack.**

Pl. 10.

Annual wool grass, eenjarige borseltjiegras.

Annual; tufted; 120–350 mm tall. Leaf blades 60–100 mm long; 4–6 mm wide. Spikelets usually about 10 mm long; 3 mm wide. Inflorescence 10 mm wide; spikelets in groups of five; lower glumes are convex on the lower half, have a central constricted area and then curve outwards, with the tip being acute or awned, and length variable up to 15 mm long.

Flowering December to April. Pioneer grass on sandy soils. Locally common. Biome: Savanna and Nama-Karoo. Angola. Natural pasture.

Description: Muller 1984 (60), Chippindall 1955 (438). Illustration: Muller 1984 (fig. 27). Voucher: Maguire 2164. PRECIS code 9901380–00500.

***Anthoxanthum* L.**

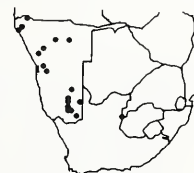
Flavia Fabric., *Foenodorum* Krause, *Xanthanthus* St-Lager.

Annual, or perennial; caespitose to decumbent. Culms 50–900 mm high; herbaceous; unbranched above. *The shoots aromatic (coumarin-scented)*. Leaf blades linear to lanceolate; flat. *Ligule an unfripped membrane*. *Plants bisexual, with bisexual spikelets*.

Inflorescence a single raceme (rarely), or paniculate; contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 5–10 mm long; compressed laterally; disarticulating above the glumes. Glumes two; very unequal; long relative to the adjacent lemmas (i.e., the longer glumes); awless; similar (membranous). *Proximal incomplete florets 2*.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; 1–7 nerved; entire, or incised; awnless, or awned. Awns when present 1; geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; relatively long. Stamens 2, or 3 (rarely). Ovary glabrous. Fruit small; hilum short; embryo small.



Cytology, classification, distribution. Chromosome base number, $x = 5$. Pooideae; Poodae; Aveneae. 20 species. North temperate & mountains of tropical Africa & Asia. Mesophytic; in shade and in open habitats (meadows, grasslands and in light shade). Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. Indigenous species (4), naturalized species (1).

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.

- 1(0). Lower glume 1-nerved 2
 Lower glume 3–5-nerved 3
 2(1). Lower lemma about 3 mm long, dark brown and
 densely hairy *A. odoratum*
 Lower lemma about 5 mm long, pale to light brown
 and usually sparsely hairy *A. ecklonii*
 3(1). Panicle small, oblong, contracted or reduced to a
 scanty raceme; plants fine and weak, leaves soft .
 *A. tongo*
 Panicle spike-like, fairly dense, occasionally
 interrupted near the base; plants usually distinctly
 tufted and erect, leaves rigid and pungent
 *A. dregeanum*

Anthoxanthum brevifolium Stapf

Perennial; rhizomatous and tufted; 150–220 mm tall.

Flowering March. Biome: Savanna. This species is known only from the type collection (Galpin 6884). Except for the very short and broad leaf blades this specimen cannot be distinguished from *A. ecklonii* and therefore it is not regarded as a distinct taxon. The genus as a whole is in great need of revision.

Description: Chippindall 1955 (92). PRECIS code 9901640–00100.



Anthoxanthum dregeanum (Nees) Stapf

Perennial; rhizomatous and tufted; 200–600 mm tall. Leaf blades to 250 mm long; to 9 mm wide. Spikelets 6–7 mm long. Leaf blades rigid, often folded; panicle spike-like, occasionally interrupted near the base; lower glume 3-nerved.

Flowering October to January.

On moist mountainslopes. Infrequent to locally common. Biome: Fynbos. Endemic. Sometimes not clearly distinguished from *A. tongo*, which normally is a very fine plant with a scanty panicle.

Description: Stapf 1898–1900 (466), Chippindall 1955 (92). Illustration: Chippindall 1955 (fig. 63). Voucher: Esterhuysen 26575. PRECIS code 9901640–00200.



Anthoxanthum ecklonii (Nees ex Trin.) Stapf

Fig. 18. Pl. 11.

Perennial; loosely or densely tufted and rhizomatous; 350–800 mm tall. Leaf blades 70–250 mm long; 4–9 mm wide. Spikelets 6–8 mm long. Bases of culms usually bulbous; panicle spike-like, 40–130 mm long; lower glume 1-nerved; lower lemma about 5 mm long, pale to light brown, usually sparsely hairy.



Fig. 18. *Anthoxanthum ecklonii*

Flowering December to April. Usually in moist places such as streamsides and on grassy mountain slopes, extending to forest margins. Infrequent (but fairly widespread). Biome: Fynbos, Savanna, and Grassland. Possibly Malawi. Resembles *A. odoratum*, which has lemmas shorter, darker and densely hairy.

Description: Stapf 1898–1900 (466), Chippindall 1955 (92). Illustration: Chippindall 1955 (fig. 64). Voucher: Killick 1296. PRECIS code 9901640–00300.

Anthoxanthum odoratum L.

Sweet vernal grass.

Perennial; loosely or densely tufted; 300–600(–1000) mm tall. Leaf blades 150–300 mm long; 2–8 mm wide. Spikelets 7–10 mm long. Panicle spike-like, 10–90 mm long; lower glume 1-nerved; lower lemma about 3 mm long, dark brown, densely hairy.



Flowering October to February. Humic soils in moist, swampy areas. Rare. Locally common. Naturalized from Europe. Biome: Savanna. Eurasia. Resembles *A. ecklonii*, which has the lemma about 5 mm long, lighter coloured and sparsely hairy.

Description: Hitchcock & Chase 1950 (528), Chippindall 1955 (93). Illustration: Hitchcock & Chase 1950 (fig. 1114). Voucher: Acocks 22118. PRECIS code 9901640–00400.

Anthoxanthum tongo (Trin.) Stapf

Perennial; culms very fine, straggling or loosely tufted (occasionally mat-forming); 100–400 mm tall. Leaf blades 20–100(–170) mm long; filiform, to 2 mm wide. Spikelets 5–7 mm long. Panicle small, oblong, contracted or reduced to a scanty raceme, with very few spikelets; lower glume 3–5-nerved.



Flowering September to February. In moist shady places in the shelter of rocks and in shallow crevices. Locally common. Biome: Fynbos. Endemic. Many specimens deposited under *A. tongo* and *A. dregeanum* at PRE seem to be misplaced. This problem cannot be solved within the current classification and stresses the need for a revision of this genus which is very poorly studied in the FSA region.

Description: Stapf 1898–1900 (467), Chippindall 1955 (92). Illustration: Chippindall 1955 (fig. 62). Voucher: Esterhuysen 33603. PRECIS code 9901640–00500.

Aristida L.

Aristopsis Catus, *Arthratherum* P. Beauv., *Chaetaria* P. Beauv., *Curtopogon* P. Beauv., *Kielboul* Adans., *Moulinsia* Raf., *Streptachne* R. Br., *Trixostis* Raf.

Annual, or perennial; caespitose. Culms 100–1000(–1800) mm high; herbaceous; branched above, or unbranched above. Leaf blades linear, or linear-lanceolate; flat, or rolled. *Ligule a fringed membrane to a fringe of hairs.*

Inflorescence paniculate; open, or contracted; espathate. Spikelet-bearing axes persistent.

Spikelets 4–30 mm long; compressed laterally to not noticeably compressed; disarticulating above the glumes. *Rachilla terminated by a female-fertile floret.* Glumes two (membranous to papery); relatively large; very unequal, or more or less equal; or at least the G2 about equalling the spikelets (or longer); awned, or awnless; very dissimilar, or similar. *Lower glume 1 nerved. All florets female-fertile; proximal incomplete florets absent.*

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (narrow, cylindrical); hairy (rarely), or hairless; with a clear germination flap; 1–3 nerved; entire; awned. Awns usually triple or trifid, commonly with a basal column, or not of the triple/trifid, basal column type (the column sometimes absent, the lateral branches sometimes reduced or absent); 1, or 3. Awns apical; *non-geniculate (at least, not geniculate in the normal sense)*; hairless (usually

glabrous); much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; conspicuous but relatively short, or very reduced; 1-nerved, or 2-nerved, or nerveless. Lodicules when present 2; membranous; glabrous. Stamens 1–3. Ovary glabrous. Fruit small to large (3–11 mm); fusiform; hilum short, or long-linear; pericarp fused; embryo large.



Fig. 19. *Aristida congesta* subsp. *congesta*

Photosynthetic pathway. C₄. The anatomical organization unconventional. Organization of PCR tissue *Aristida* type. Biochemical type NADP-ME (3 species); XyMS- (with double PCR sheaths).

Cytology, classification, distribution. Chromosome base number, $x = 11$ and 12. Arundinoideae; Aristideae. 290 species. Temperate and subtropical. Xerophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 27 indigenous species.

References. 1. De Winter. 1965. *Bothalia* 8: 199. 2. Melderis. 1971. *FZ*. 3. Giess. 1971. *Bothalia* 10: 365.

Species treatment by L. Smook.

- 1(0). Lemma awn solitary or the two lateral awns poorly developed, less than 1/4 the length of the central awn 2
 Lemma awns three, lateral awns well developed, longer than 1/4 the length of the central awn ... 3
 2(1). Plants annual; lemma articulation between the apex of the lemma and the base of the column
 A. parvula
 Plants perennial; lemma without articulation
 *A. transvaalensis*
 3(1). Lower glume without an awn or mucro 4
 Lower glume with an awn or mucro (which can be minute) 24
 4(3). Lower glume longer than the upper glume (Note: in some species the long, delicate apex breaks off early) 5
 Lower glume shorter than to equalling the upper glume 6
 5(4). Plants annual; spikelets 25–30 mm long (including awns); lower glume narrowing abruptly to an acute apex; lemma not narrowed into a beak or twisted column *A. effusa*
 Plants perennial; spikelets to 20 mm long (including awns); lower glume long, tapering to an acuminate apex; lemma narrowed into a beak or short twisted column *A. monticola*
 6(4). Lower glume 2/3 as long as to longer than the upper glume 7
 Lower glume 1/2–2/3 the length of the upper glume 10
 7(6). Plants perennial 8
 Plants annual 9
 8(7). Lemma without a column; callus subobtusate to rounded; lower glume firm throughout, but the extreme tip membranous
 *A. canescens* subsp. *canescens*
 Lemma with a column; callus emarginate to distinctly bifid; lower glume firm below, upper 2/3 membranous and often torn *A. spectabilis*
 9(7). Inflorescence narrowly oblong to lanceolate; lemma usually scabrid only on the keel . *A. adscensionis*
 Inflorescence ovate; lemma usually scabrid all over except on the lower 1/4 *A. effusa*
 10(6). Plants annual 11
 Plants perennial 12
 11(10). Lower glume 3.5–4.0 mm long, broadly oblong, apex obtuse to truncate or slightly emarginate, fimbriate; spikelets bright yellow with glume tips dark *A. dewinteri*
 Lower glume 6–9 mm long, lanceolate, apex acute, not fimbriate; spikelets dull yellow to purple but glume tips not with a dark patch . *A. stipoides*
 12(10). Lemma articulation absent or inconspicuous . 13
 Lemma articulation present between the apex of the lemma and the base of the column 16
 13(12). Plants robust; culm diameter 5–6 mm . *A. sciurus*
 Plants slender; culm diameter 1.5–3.0 mm ... 14
 14(13). Culms much branched from the upper nodes; leaves folded, straight, rigid, erect ... *A. dasydesmis*
 Culms unbranched or sparsely branched from the

- upper nodes; leaves flat or rolled, curved or slightly curled, not straight and erect 15
 15(14). Spikelets to 22 mm long (including awns), congested on the inflorescence branches; callus tip naked, rounded and swollen
 *A. canescens* subsp. *canescens*
 Spikelets 25–40 mm long (including awns), distinct from one another on the inflorescence branches; callus tip bifid *A. diffusa* subsp. *burkei*
 16(12). Lower internodes of culms pubescent to woolly-hairy, upper internodes pubescent or glabrous .
 17
 Lower and upper culm internodes glabrous ... 18
 17(16). Lemma column 8–20 mm long; inflorescence oblong to broadly oblong, symmetrical, to 800 mm long and over 200 mm wide, much branched *A. meridionalis*
 Lemma column 5–7 mm long; inflorescence narrowly oblong to narrowly elliptic, usually asymmetric, to 200 mm long and 120 mm wide *A. vestita*
 18(16). Callus tip truncate, obliquely truncate or slightly emarginate; leaves erect and rigid
 *A. dasydesmis*
 Callus tip bifid; leaves curved or bent, flexible, not rigid 19
 19(18). Lower glume with upper 1/3 membranous, often torn and broken *A. spectabilis*
 Lower glume apex firm or only the very tip membranous 20
 20(19). Some leaf auricles with long woolly hairs
 *A. meridionalis*
 All leaf auricles glabrous or pubescent but not with long woolly hairs 21
 21(20). Culms much branched
 *A. engleri* var. *ramosissima*
 Culms unbranched or sparsely branched 22
 22(21). Lower glume apex acute, finely fimbriate
 *A. engleri* var. *engleri*
 Lower glume apex obtuse, usually entire, only occasionally coarsely fimbriate 23
 23(22). Upper glume 12–18 mm long
 *A. diffusa* subsp. *diffusa*
 Upper glume to 12 mm long
 *A. diffusa* subsp. *burkei*
 24(3). Lemma articulation present (sometimes shown only by a swollen line or colour differentiation, usually directly below the branching point of the awns) 25
 Lemma articulation absent 34
 25(24). Lemma articulation between the apex of the lemma and the base of the long column; callus 1.5–3.0 mm long, tip acuminate, pungent 26
 Lemma articulation not as above; callus 0.5–1.5 mm long, tip narrowly or broadly rounded to truncate 31
 26(25). Lower internodes of culms woolly to densely tomentose 27
 Lower internodes of culms glabrous or pubescent but not with woolly hairs 28
 27(26). Inflorescence contracted, spikelike, very dense .
 *A. mollissima* subsp. *mollissima*
 Inflorescence narrow, lax, more or less divarcatly branched *A. mollissima* subsp. *argentea*
 28(26). Inflorescence spikelike, sometimes interrupted towards the base, branches closely appressed to the main axis 29
 Inflorescence not spikelike, much interrupted, branches suberect or spreading 30
 29(28). Plants robust, to 1500 mm tall, sparsely branched at upper nodes; inflorescence usually 150–300 mm long *A. stipitata* subsp. *stipitata*
 Plants slender, to 600 mm tall, much branched at the upper nodes; inflorescence usually to 150 mm long *A. stipitata* subsp. *spicata*
 30(28). Plants robust; culm diameter 2.5–4.0 mm;

- inflorescence usually 200–350 mm long
 **A. stipitata subsp. robusta**
 Plants slender; culm diameter 1.0–2.5 mm;
 inflorescence usually 100–200 mm long
 **A. stipitata subsp. graciliflora**
 31(25). Culm internodes pubescent; lemma slightly
 narrowed at apex but column absent, articulation
 between the apex of the lemma and the branching
 point of the awns **A. hordeacea**
 Culm internodes glabrous; lemma narrowed into a
 distinct column, articulation between the apex of
 the column and the branching point of the awns
 32
 32(31). Spikelet clusters linear to oblanceolate (including
 awns), longest pedicel to 5.5 mm long; plants
 robust and coarse **A. pilgeri**
 Spikelet clusters narrowly obovate (including
 awns), longest pedicel to 1.5 mm long; plants
 usually slender 33
 33(32). Inflorescence very dense, branches closely
 appressed and covering main axis except
 occasionally at the base where 1–2 subsapicate
 branches spread from the main axis
 **A. congesta subsp. congesta**
 Inflorescence variable, with many side branches
 spreading from and exposing the main axis, these
 either with a few spikelets laxly clustered or
 many spikelets densely clustered at the ends of
 the long, naked side branches, or with spikelets
 appressed all along the side branches
 **A. congesta subsp. barbicollis**
 34(24). Plants annual 35
 Plants perennial to subperennial 40
 35(34). Lemma narrowly elliptic, dorsally compressed . .
 **A. hubbardiana**
 Lemma linear, laterally compressed 36
 36(35). Lower glume with a distinct, robust awn 0.8–3.5
 mm long 37
 Lower glume mucronate or with a short awn to 0.8
 mm long 39
 37(36). Spikelets coarse, 35–50 mm long (including awns)
 **A. rhinoclhoa**
 Spikelets slender and fine, 10–30 mm long
 (including awns) 38
 38(37). Inflorescence delicate, branchlets and pedicels
 spreading, with spikelets distant from one
 another at the end of the branches
 **A. scabrivalvis subsp. scabrivalvis**
 Inflorescence robust, branchlets and pedicels
 appressed, with spikelets densely congested at
 the ends of branches
 **A. scabrivalvis subsp. contracta**
 39(36). Inflorescence oblong to ovate, 80 mm or wider, side
 branches spreading from the main axis with lax
 clusters of 2–3 spikelets distant from each other
 at the ends; lower glume 3/4 as long to equaling,
 sometimes longer than the upper glume
 **A. effusa**
 Inflorescence linear to lanceolate, usually 10–50
 mm wide, side branches appressed to main axis,
 spikelike but interrupted towards the base, or
 open and spreading, spikelets densely clustered;
 lower glume usually 2/3 or 3/4 the length of the
 upper glume **A. adscensionis**
 40(34). Inflorescence open, branches rigid, spreading at 90
 degrees from the main axis; lower glume equal
 to or longer than the upper glume . **A. bipartita**
 Inflorescence contracted, usually dense, branches
 flexible, erect or spreading not more than 45
 degrees from the main axis; glumes variable, but
 lower glume never longer than the upper glume
 41
 41(40). Spikelets to 14 mm long (including awns)
 **A. recta**
 Spikelets 15–40 mm long (including awns) . . . 42

- 42(41). Lemma oblong, almost the same width throughout,
 sometimes with a minute constriction at the
 branching point of the awns; column absent . .
 **A. canescens subsp. canescens**
 Lemma narrowly lanceolate, distinctly tapering
 towards the branching point of the awns; column
 present or absent 43
 43(42). Leaves mainly basal, forming a dense basal tuft in
 which the culms are hidden; culms mainly
 unbranched in the upper nodes 44
 Leaves mainly cauline, or not basally dense and the
 culms obvious for most of their length; culms
 branched or unbranched in the upper nodes . 45
 44(43). Rhizomes long, oblique, thin and creeping;
 spikelets 15–30 mm long (including awns);
 glumes usually very unequal; high eastern
 mountains . . . **A. junciformis subsp. galpinii**
 Rhizomes short and stout; spikelets 20–35 mm long
 (including awns); glumes equal to subequal;
 bushveld and the highveld . . . **A. aequiglumis**
 45(43). Culms much branched, usually at every node;
 lateral awns usually rudimentary, very much
 shorter and thinner than the central awn
 **A. transvaalensis**
 Culms branched, but not at every node; lateral awns
 well developed, shorter or subequal to the central
 awn, never rudimentary
 **A. junciformis subsp. junciformis**

Aristida adscensionis L.

(= *A. curvata* (Nees) Dur. &
 Schinz.) 1; (= *A. submucronata*
 Schumach.) 1; (= *A. adscensionis*
 L. subsp. *guineensis* (Trin. &
 Rupr.) Henr.) 2.

Annual bristle grass, steek-
 gras.

Pl. 12.



Annual; tufted (erect, often branched); to 1000 mm tall.
 Leaf blades to 300 mm long; to 3 mm wide. Spikelets 10–40
 mm long (including awns). Inflorescence narrowly oblong
 to lanceolate, 10–50 mm wide, usually spikelike, interrupted
 at base, with the side branches appressed to main axis,
 sometimes branches open and spreading, with the spikelets
 densely clustered on the branches; lower glume 2/3–3/4 the
 length of the upper glume, sometimes with a mucro or short
 awn to 0.8 mm long; lemma laterally compressed, articula-
 tion and column absent; awns three, laterals well developed,
 shorter than the central awn; callus with rounded, naked tip.

Flowering December to September. Stony, sandy loam,
 clayey, calcareous, shallow soils on stony hills, moist areas
 along pans and rivers, along roads and other disturbed
 ground. Common. Biome: Savanna, Grassland, and Nama-
 Karoo. Throughout the tropics. Pasture (only grazed when
 very young), or indicator (of advanced retrogression of veld
 and disturbed ground), or weed (troublesome in wool, also
 causes sores by piercing the sheep's skin). This species has
 a very wide geographical distribution and exhibits a
 considerable variation in its external morphology. In the
 past it has been divided into species, subspecies and
 varieties. The treatment of Melderis (1972) is followed
 pending a detailed study. Some forms resemble *A.*
hubbardiana, which has the lemma dorsally compressed,
 and forms of *A. congesta*, which have a lemma articulation
 between the apex of the column and the branching point of
 the awns.

Description: De Winter 1965, Melderis 1971 (110).
 Illustration: Muller 1984 (fig. 28). Voucher: Smook 2781,
 Van Jaarsveld 179, Schmitz 1523. PRECIS code
 9902620–00050.

Aristida aequiglumis Hack.

Curly-leaved three-awned grass.

Stout and shortly rhizomatous and tufted (densely); to 800 mm tall. Leaf blades to 150 mm long; to 1 mm wide. Spikelets 20–35 mm long (including awns). Culms usually unbranched; leaves mainly basal, forming a dense basal tuft, enclosing the culms for most of its length; inflorescence contracted, dense, much branched, branches not spreading more than 45 degrees from the main axis; glumes equal to subequal, often pubescent, lower glume mucronate; lemma narrowly lanceolate, tapering upwards, articulation absent; column long and twisted; awns three, laterals shorter but well developed; callus tip naked, truncate to slightly emarginate.

Flowering December to May. Sandy, shallow soils on rocky hillslopes or in seasonally flooded areas. Common. Biome: Savanna and Grassland (occasionally). Zimbabwe to Zambia. Indicator (of eroded soils). Although this species occurs on the highveld, it is more common in bushveld areas. It resembles *A. junciformis* subsp. *galpinii*, which has a long, thin, oblique rhizome, generally unequal glumes and is found on the high mountain sourveld.

Description: De Winter 1965 (262), Melderis 1971 (107). Voucher: Smook 2709, Smook 1435. PRECIS code 9902620–00200.

*Aristida bipartita* (Nees) Trin. & Rupr.

Three-awned rolling grass.

Perennial (to subperennial); tufted (erect or geniculate); to 650 mm tall. Leaf blades to 200 mm long; to 2 mm wide. Spikelets 18–20 mm long (including awns). Inflorescence open, branches rigid, naked for most of their length, spreading at 90 degrees from the main axis, spikelets borne at the tips of the long, naked branches; lower glume equalling or longer than the upper glume, awned; lemma articulation and column absent; awns three, subequal; callus tip thickened, naked, rounded to obtuse.

Flowering October to May. Sandy, stony, loamy, clayey and black turf soils in moist areas around vleis and dongas, and in overgrazed and other disturbed ground. Common. Biome: Savanna and Grassland. Mozambique. The whole inflorescence breaks off at maturity and is rolled about as a tumbleweed by the wind. Resembles *A. effusa*, which is a definite annual and has the lower glume with or without a mucro, and resembles forms of *A. scabrivalvis*, which is an annual with the lower glume less than 2/3 the length of the upper glume (excluding awns).

Description: De Winter 1965 (256), Melderis 1971 (114). Voucher: Scheepers 1574. PRECIS code 9902620–00400.

*Aristida canescens* Henr. subsp. *canescens*

Vaalsteekgras.

Slender perennial; tufted (erect); to 1500 mm tall. Leaf blades to 300 mm long; to 2 mm wide. Spikelets to 22 mm long (including awns). Culms 1.5–3.0 mm in diameter, unbranched to sparsely branched from the upper nodes; leaves flat or rolled, curved to curled; spikelets congested on the inflorescence branches; lower glume firm except for the very tip, which is membranous, 1/2 as long as to nearly equalling the upper glume, without mucro or awn; lemma



articulation and column absent; awns three; callus tip naked, subobtusely to rounded.

Flowering December to May. Shallow, sandy, stony soils on rocky ridges, eroded and disturbed ground. Locally common. Biome: Savanna and Grassland. Zimbabwe to Zambia. Differs from subsp. *ramosa*, which has the culms branched from the upper nodes and the lower glume awned. Resembles *A. junciformis*, which has the lower glume awned or mucronate, *A. pilgeri*, which has the lemma articulation present, and *A. sciurus*, which has a culm diameter of 5–6 mm.

Description: De Winter 1965 (260). Voucher: Smook 2063, De Winter 7561. PRECIS code 9902620–00500.

Aristida canescens Henr. subsp. *ramosa* De Winter

Perennial; tufted (culms sometimes geniculate); to 600 mm tall. Leaf blades to 150 mm long; to 1.5 mm wide. Spikelets 15–18 mm long (including awns). Culms branched from the upper nodes; inflorescence contracted, branches erect or spreading not more than 45 degrees from the main axis; lower glume more than 2/3 the length of the upper, awned; lemma oblong, almost the same width throughout, sometimes with a minute constriction at the branching point of the awns, articulation and column absent; awns three, subequal; callus tip naked, swollen, rounded.

Flowering July, December, February, and March. Dolerite slopes. Infrequent. Biome: Nama-Karoo. Endemic. Differs from subsp. *canescens*, which has the culm mainly unbranched and the lower glume unawned.

Description: De Winter 1965 (262). Voucher: Donaldson 318. PRECIS code 9902620–00550.

*Aristida congesta* Roem. & Schult. subsp. *barbicollis* (Trin. & Rupr.) De Winter

(=*A. barbicollis* Trin. & Rupr.) l.

Spreading prickly grass, witsteekgras.

Perennial, or annual (slender); tufted; to 750 mm tall. Leaf blades to 200 mm long; to 3 mm wide. Spikelets 20–30(–50) mm long (including awns). Inflorescence variable, with many side branches spreading from and exposing the main axis, either with a few spikelets laxly clustered or with many spikelets densely clustered at the ends of long, naked side branches or spreading to the base of the side branches; spikelet clusters narrow, obovate to ovate (including awns), longest pedicel to 1.5 mm long; lower glume awned; lemma articulation between the apex of the column and the branching point of the awns, articulation sometimes represented only by a swollen line or colour differentiation; column present; awns three, laterals well developed; callus 0.5–1.5 mm long, tip naked, narrow or broadly rounded to truncate.

Flowering October to May. Deep, sandy clayey soils on rocky hillsides, old lands and disturbed ground. Common. Biome: Savanna and Grassland. Northwards to East Africa. Indicator (poor veld management or other disturbances), or weed (the floret callus penetrates sheep skins causing sores). The spikelets of the two subspecies cannot be distinguished from each other, the inflorescence shape being the main character used but this tends to intergrade. Thus there are some plants that cannot be referred to with certainty to either subspecies. In this treatment, pending further study, specimens with inflorescences open and lax or those with most of the side branches spreading from and exposing the main axis are included in subsp. *barbicollis*.

Description: De Winter 1965 (296), Melderis 1971 (129). Illustration: Melderis 1971 (tab. 33). Voucher:



Smook 2787, 5703, Codd 4865, Herbst 50. PRECIS code 9902620-00800.

Aristida congesta* Roem. & Schult. subsp. *congesta

Fig. 19.

(= *A. alopecuroides* Hack.) 1;
(= *A. longicauda* Hack. &
Henriques) 1.

Katstertsteekgras.

Slender perennial, or annual (occasionally); densely tufted; to 900 mm tall. Leaf blades to 300 mm long; to 5 mm wide. Spikelets 25–30 mm long (including awns). Inflorescence very dense, branches closely appressed, enclosing main axis except occasionally at the base where 1–2 subsapiculate side branches spread away from the main axis; spikelet clusters narrowly obovate to obovate; lower glume awned; lemma articulation between the apex of the column and the branching point of the awns, articulation sometimes represented only by a swollen line or a colour differentiation; column present; awns three, laterals well developed; callus tip naked, narrowly to broadly rounded to truncate.

Flowering December to May. Hard or stony loam, sandy basalt, black clayey soils, Kalahari sands on stony slopes, open eroded places, old lands, road verges and other disturbed ground. Common. Biome: Savanna and Grassland. Northwards to northeast and east Africa and the Mediterranean. Pasture (for small stock only), or indicator (of retrogression of veld), or weed (tangles in wool, and the floret callus pierces the skin and causes sores). The spikelets of the two subspecies cannot be distinguished from each other, inflorescence shape being the main character used although it tends to intergrade. Thus there are some plants that cannot be referred to with certainty to either subspecies. In this treatment, pending further studies, specimens with very dense inflorescences, with branches closely appressed and covering the main axis, occasionally interrupted at the base by 1–2 spreading branches are included in this subspecies. Resembles *A. hordeacea*, which has culm internodes pubescent and column absent, and *A. hubbardiana*, which has the lemma articulation absent.

Description: De Winter 1965 (296), Melderis 1971 (127). Illustration: Muller 1984 (fig. 29). Voucher: Theron 1264, Giess, Volk & Bleissner 7027, De Winter & Marais 4128. PRECIS code 9902620-00850.

***Aristida dasydesmis* (Pilg.) Mez**

Slender perennial; densely tufted; to 800 mm tall. Leaf blades to 300 mm long; about 1 mm wide. Spikelets 25–30 mm long (including awns). Culms 1.5–3.0 mm in diameter, much branched from the upper nodes; leaves mainly cauline, folded, straight, erect and rigid; lower glume just over 1/2 the length of the upper glume, mucro or awn absent; lemma articulation between the apex of the lemma and the base of the column, sometimes inconspicuous or absent; column to 6 mm long; awns three, laterals well developed; callus tip naked, truncate, obliquely truncate or slightly emarginate.

Flowering August to September. Granite slopes in arid areas. Locally common. Biome: Succulent Karoo. Endemic. Resembles *A. junciformis* subsp. *junciformis* and *A. transvaalensis*, which both have the lower glumes awned or mucronate. Similar to *A. vestita*, which has the lower internodes pubescent to woolly-hairy, and *A. diffusa*, which has flexible leaves.

Description: De Winter 1965 (275). Voucher: Acocks 19518. PRECIS code 9902620-01000.



***Aristida dewinteri* Giess**

Annual; tufted; to 1000 mm tall. Leaf blades to 300 mm long; to 3 mm wide. Spikelets 40–50 mm long (including awns). Spikelets bright yellow, with a dark patch at the apex of the glumes; lower glume 3.5–4.0 mm long, broadly oblong, apex obtuse to truncate or slightly emarginate, fimbriate, 1/2 the length of the upper glume, without a mucro or awn; lemma articulation between the apex of the lemma and the base of the column; column 1.3–1.4 mm long; awns three, laterals well developed but shorter than the central awn; callus tip naked, distinctly bifid.

Flowering April. Rare. Locally common (where found). Biome: Nama-Karoo. Endemic, or possibly also in Angola. Only the holotype was available for this treatment.

Description: Giess 1971 (365). Voucher: Giess 9345 (holotype PRE). PRECIS code 9902620-01100.



***Aristida diffusa* Trin. subsp. *burkei* (Stapf) Meld.**

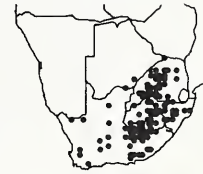
(= *A. diffusa* Trin. var. *burkei* (Stapf) Schweick.) 2.

Koperdraadgras, ystergras.

Slender perennial; densely tufted; to 1000 mm tall. Leaf blades to 300 mm long; to 2 mm wide. Spikelets 25–40 mm long (including awns). Culms 1.5–3.0 mm in diameter, unbranched or sparsely branched; leaf auricles glabrous or short-hairy, not woolly; inflorescence open, with spikelets distant from one another; lower glume obtuse, occasionally coarsely fimbriate at the apex, 1/2–2/3 the length of the upper glume, mucro or awn absent; upper glume to 12 mm long; lemma articulation present between the apex of the lemma and the base of the column, or absent; column present; callus tip naked, deeply bifid.

Flowering November to April. Dry, sandy, gravelly loam soils on hilly slopes. Common. Biome: Savanna, Grassland, and Nama-Karoo. Zimbabwe. Indicator (of overgrazing). Barely distinguished from subsp. *diffusa*, from which it is separated by the longer upper glume and the distribution. Further study is needed.

Description: De Winter 1965 (275), Melderis 1971 (118). Voucher: Smook 6404, 3442, Smook & Gibbs Russell 2275. PRECIS code 9902620-01200.



Aristida diffusa* Trin. subsp. *diffusa

(= *A. diffusa* Trin. var. *genuina* Henr.) 1; (= *A. diffusa* Trin. var. *pseudo-hystrix* (Trin. & Rupr.) Henr.) 1.

Slender perennial; densely tufted (erect); to 750 mm tall. Leaf blades to 300 mm long; to 2 mm wide. Spikelets 25–45 mm long (including awns). Culms unbranched or sparsely branched; leaves flexible, leaf auricles glabrous or short-hairy, not woolly; lower glume 1/2–2/3 the length of the upper glume, apex obtuse, occasionally coarsely fimbriate; upper glume 12–18 mm long; lemma articulation present between the apex of the lemma and the base of the column, or absent; column present; awns three, laterals well developed; callus tip naked, deeply bifid.

Flowering October. Sandy soils, between rocks and in disturbed places. Infrequent. Biome: Fynbos. Endemic. Barely distinguishable from subsp. *burkei*, from which it is mainly separated by the shorter upper glume. Further study is needed.



Description: De Winter 1965 275. Voucher: Liebenberg 4240. PRECIS code 9902620-01300.

***Aristida effusa* Henr.**

Spreading steekgras, pluim-steekgras.

Annual; tufted (branched, erect); to 900 mm tall. Leaf blades to 300 mm long; to 3 mm wide. Spikelets 25–32 mm long (including awns). Inflorescence open, ovate, spikelets clustered at the end of lax, flexible branches; lower glume 2/3 as long to longer than the upper glume, narrowed abruptly into a short, acute apex, mucro or awn absent; lemma usually scabrid except for lower 1/4, articulation absent; column or beak absent, awns three, laterals shorter; callus tip naked, swollen, rounded.

Flowering February to May. Calcareous, sandy loam, stony soils along roadsides. Locally common. Biome: Savanna. Endemic. Indicator (retrogression of veld). Specimens from Botswana previously referred to as *A. wildii* Meld. have been placed here pending a more detailed study. Resembles some forms of *A. scabrivalvis*, which has the lower glume strongly awned, and *A. bipartita*, which is perennial with the lower glume awned.

Description: De Winter 1965 (251). Illustration: Muller 1984 (fig. 30). Voucher: De Winter & Leistner 5174, Field 3051. PRECIS code 9902620-01400.

Aristida engleri* Mez var. *engleri

Engler's bristle grass, bristle three-awn.

Densely tufted (erect to geniculate); to 700 mm tall. Leaf blades to 150 mm long; to 2.5 mm wide. Spikelets 25–35 mm long (including awns). Culms unbranched or sparsely branched; leaves flexible; leaf auricles glabrous to short-hairy, not woolly; lower glume 1/2 the length of the upper glume, apex acute, finely fimbriate; lemma articulation between the apex of the lemma and the base of the column; column present; awns three, laterals well developed; callus tip naked, deeply bifid.

Flowering February to August. Rocky outcrops. Infrequent. Biome: Savanna and Nama-Karoo. Endemic. This variety is not always distinguishable from var. *ramosissima*, which has the culms much branched. Resembles *A. diffusa*, which has the lower glume with an obtuse apex which is only occasionally coarsely fimbriate, and *A. vestita*, which has lower internodes pubescent to woolly-hairy.

Description: De Winter 1965 (281). Illustration: Muller 1984 (fig. 31). Voucher: Giess & Muller 11954, Theron 1972. PRECIS code 9902620-01500.

***Aristida engleri* Mez var. *ramosissima* De Winter**

Perennial; tufted (to sprawling); to 900 mm tall. Leaf blades to 150 mm long; to 2 mm wide. Spikelets 20–25 mm long (including awns). Culms much branched; leaves flexible, leaf auricles glabrous or shortly pubescent; lower glume to 1/2 the length of the upper glume; lemma articulation between the apex of the lemma and the base of the column; column present; awns three; callus tip naked, deeply bifid.

Flowering January to June. Red sandy soils between rocks on hillsides. Locally common. Biome: Savanna and Nama-Karoo. Endemic. This variety is not always

distinguishable from var. *engleri*, which has culms unbranched or sparsely branched.

Description: De Winter 1965 (281). Illustration: Muller 1984 (fig. 32). Voucher: Liebenberg 5228. PRECIS code 9902620-01600.

***Aristida hordeacea* Kunth**

Jakkalsstert, garssteekgras.

Annual; tufted (erect to geniculate); to 900 mm tall. Leaf blades to 300 mm long; to 10 mm wide. Spikelets 15–45 mm long (including awns). Culm internodes pubescent; leaves and sheaths usually scabrid; inflorescence very dense, spike-like, sometimes interrupted at the base; lower glume to 2/3 the length of the upper glume (excluding awns), long awned; lemma articulation between the apex of the lemma and the branching point of the awns; column absent but lemma narrowed below the branching point of the awns; awns three, subequal; callus 0.5–1.5 mm long, tip naked, narrowly to broadly rounded.

Flowering January to May. Moist heavy soils in shallow depressions, on edges of pans and vleis, in old farmlands. Locally common. Biome: Savanna. Throughout tropical Africa. Indicator (of retrogression of veld). Resembles *A. hubbardiana*, which has no articulation on the lemma, and forms of *A. congesta* subsp. *congesta*, which have a distinct column.

Description: De Winter 1965 (245), Melderis 1971 (116). Illustration: Muller 1984 (fig. 33), Melderis 1971 (tab. 31). Voucher: De Winter 2729, Giess & Muller 11804. PRECIS code 9902620-01700.

***Aristida hubbardiana* Schweick.**

Annual; densely tufted (branched, erect to geniculate); to 500 mm tall. Leaf blades to 100 mm long; to 2 mm wide. Spikelets 10–30 mm long (including awns). Culm internodes glabrous; lower leaf surface and sheaths smooth; inflorescence dense and spike-like; lower glume 2/3 as long as to nearly equaling the upper glume, short-awned; lemma narrowly elliptic, dorsally compressed, usually very scabrid in the upper 2/3 with large prickles in rows, articulation absent; column absent but lemma narrowed into a short beak; awns three, laterals well developed; callus tip naked, swollen and rounded.

Flowering March to April. Damp calcareous, clayey soils around vleis and seasonally flood depressions. Locally common (but with a limited distribution). Biome: Savanna. Endemic, possibly found in Angola. Resembles some forms of *A. adscensionis*, which has the lemma dorsally compressed, and *A. hordeacea*, which has a lemma articulation.

Description: De Winter 1965 (246). Voucher: Giess, Volk & Bleissner 6405, Smith 3641. PRECIS code 9902620-01800.

***Aristida junciformis* Trin. & Rupr. subsp. *galpinii* (Stapf) De Winter**

(= *A. galpinii* Stapf) 1.

Perennial; long, oblique, thinly rhizomatous and tufted (densely, erect); to 500 mm tall. Leaf blades to 250 mm long; to 1 mm wide. Spikelets 15–30 mm long (including awns). Culms mainly unbranched at the upper nodes; leaves mainly basal, forming a dense basal tuft in which the culms remain hidden;

inflorescence contracted, branches erect or spreading but not more than 45 degrees from the main axis; glumes usually very unequal, the lower 1/2–2/3 the length of the upper, mucronate to shortly awned; lemma narrowly lanceolate, articulation absent, lemma distinctly tapering towards a short beak or very short column; awns three, laterals well developed; callus tip naked, truncate or broadly rounded.

Flowering November to April. Shallow soils and overgrazed areas on basalt or sandstone, rocky slopes of very high mountains. Locally common. Biome: Grassland. Endemic. Indicator (overgrazed and disturbed areas). This subsp. occurs in very high mountainous sourveld. This separates it from *A. aequiglumis*, which occurs mainly in the bushveld, has a short, stout rhizome and glumes that are usually subequal to equal.

Description: De Winter 1965 (266). Illustration: Chipindall 1955 (fig. 278). Voucher: Killick 4471, Acocks 21992. PRECIS code 9902620–01900.

Aristida junciformis* Trin. & Rupr. subsp. *junciformis

Gongoni-steekgras, wire grass.

Perennial; stoutly rhizomatous and tufted (densely, erect); to 900 mm tall. Leaf blades to 300 mm long; to 3 mm wide. Spikelets 20–30 mm long (including awns). Culms unbranched to branched at some nodes; leaves mainly cauline or at least not densely basal, culms always clearly visible for most of their lengths; inflorescence contracted, dense to lax, branches erect to spreading up to 45 degrees from the main axis; lower glume up to 2/3 the length of the upper, awned; lemma narrowly lanceolate, distinctly tapering into a beak or column, articulation absent; awns three, laterals well developed; callus tip naked, swollen, rounded to truncate.

Flowering November to May. Sandy, clayey, stony soils or shallow soils on stony hillsides, in depressions where water collects and in other damp places, along roadsides and other disturbed ground. Common to locally dominant (widely distributed). Biome: Fynbos, Savanna, and Grassland. The species in the broad sense occurs northwards to East Africa. Domestic use (used for brooms), or indicator (of mismanagement of veld), or weed (extremely tough problem, pioneer grass). In this treatment De Winter's broad concept of the subspecies has been followed and specimens that may be referable to subsp. *welwitschii* may be included here. Resembles *A. transvaalensis*, which is branched at most nodes and with lateral awns either absent or shorter and thinner than the central awn. Resembles *A. aequiglumis*, which has a dense tuft of basal leaves, and *A. dasydesmis*, which has the lower glume without an awn or mucro.

Description: De Winter 1965 (266). Illustration: Chipindall 1955 (fig. 274). Voucher: Strey & Schlieben 8524, Smook 4651, De Winter 735. PRECIS code 9902620–02000.

***Aristida meridionalis* Henr.**

Langbeensteekgras.

Perennial; densely tufted; to 2000 mm tall. Leaf blades to 650 mm long; to 5 mm wide. Spikelets 35–50 mm long (including awns). Lower culm internodes glabrous or pubescent to woolly-hairy; leaves flexible, some leaf auricles with long woolly hairs; inflorescence oblong to broadly oblong, symmetrical, large, to 800 mm long and over 200 mm wide, much branched; lower glume less than 2/3 the length of the upper glume; lemma articulation between the apex of the lemma and the base of the column; column

8–20 mm long; awns three, subequal; callus tip naked, deeply bifid.

Flowering November to May. Deep sandy to stony soils in open areas, along roadsides and in moist areas around vleis and damp depressions. Locally common to common. Biome: Savanna. Angola, Zimbabwe, Mozambique, northwards to Tanzania. Domestic use (occasionally used for thatching), or pasture (only grazed when very young). Similar to *A. stipoides*, which is annual. Resembles *A. spectabilis*, which has the lower glume membranous for the upper 1/3–2/3, and *A. vestita*, which has the lemma column 5–7 mm long.

Description: De Winter 1965 (284), Clayton et al. 1970–1982 (153). Voucher: Smook 4344. PRECIS code 9902620–02100.

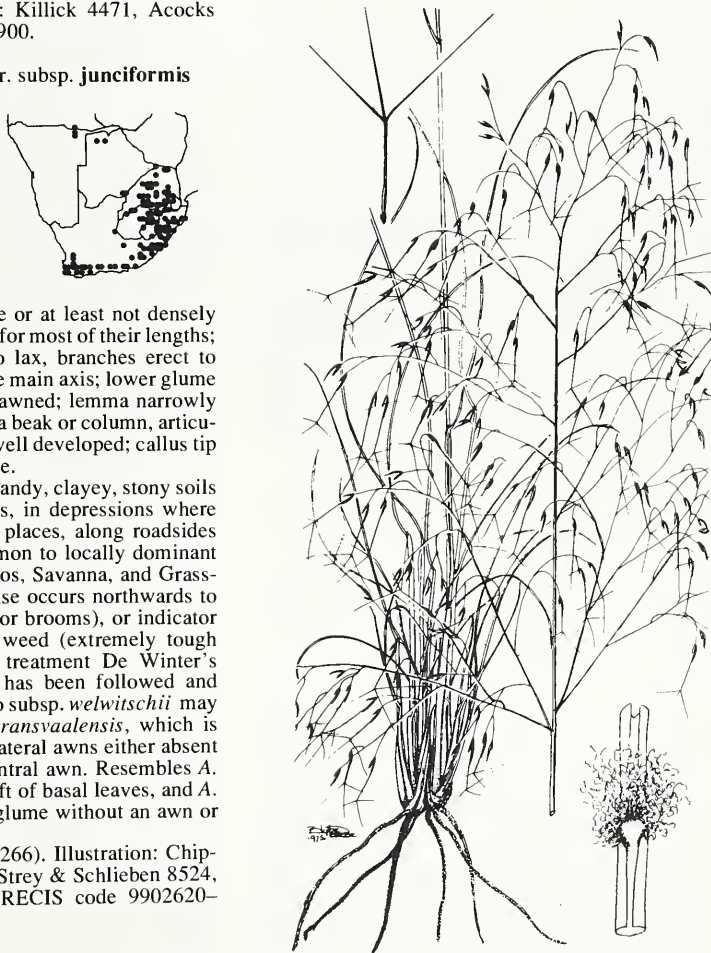


Fig. 20.

Fig. 20. *Aristida meridionalis*

***Aristida mollissima* Pilg. subsp. *argentea* (Schweick.)
Meld.**

(=*A. argentea* Schweick.) I.

Perennial; densely tufted (erect to geniculate); to 1000 mm tall. Leaf blades to 400 mm long to 4 mm wide. Spikelets 50–90 mm long (including awns). Lower internodes of culms woolly to



densely tomentose; inflorescence narrow, lax, more or less divaricately branched; lower glume to 2/3 the length of the upper glume, awned; lemma articulation between the apex of the lemma and the base of the column; column 13–30 mm long, twisted; awns three, slightly unequal to subequal; callus 1.5–3.0 mm long, tip naked, acuminate, pungent.

Flowering December to March. Light, sandy to stony sandy soils in open areas, on mountain slopes or disturbed areas. Locally common. Biome: Savanna. Zimbabwe, Mozambique, Resembles *A. stipitata* subsp. *graciliflora*, which has the lower culm internodes glabrous or pubescent but not woolly-hairy.

Description: De Winter 1965 (289), Melderis 1971. Voucher: Ellis 3211. PRECIS code 9902620–02150.

Aristida mollissima* Pilg. subsp. *mollissima

Perennial; densely tufted (erect); to 850 mm tall. Leaf blades to 300 mm long; to 4 mm wide. Spikelets 50–95 mm long (including awns). Lower internodes of culms woolly to densely tomentose; inflorescence contracted, spikelike, very dense; lower glume to 2/3 the length of the upper glume, awned; lemma articulation between the apex of the lemma and the base of the column; column 16–30 mm long; awns three, subequal; callus 1.5–3.0 mm long, tip naked, acuminate, pungent.

Flowering December to May. Deep sandy soils especially red Kalahari sands. Locally common. Biome: Savanna. Zimbabwe, Kenya. Resembles *A. stipitata* subsp. *stipitata*, which has the lower culm nodes glabrous or hairy but not woolly.

Description: De Winter 1965 (287), Melderis 1971. Voucher: Davidse 6071. PRECIS code 9902620–02200.

***Aristida monticola* Henr.**

Perennial; long rhizomatous and tufted (erect to geniculate); to 900 mm tall. Leaf blades to 120 mm long; to 2 mm wide. Spikelets 18–25 mm long (including awns). Culms much branched; lower glume longer than the upper glume, long tapering to an acuminate apex (this often breaks very early, giving a false idea of the length), no awn or mucro; lemma without articulation, but a beak or short, twisted column is present; awns three, two laterals shorter than central; callus tip naked, rounded to truncate.

Flowering January to May. Moist and shady situations such as stream banks and seepage areas on mountain slopes. Locally common (in the Drakensberg). Biome: Grassland. Endemic. Resembles *A. transvaalensis* and some forms of *A. junciformis*. These two species have the lower glume awned or mucronate.

Description: De Winter 1965 (265). Voucher: Killick 1382. PRECIS code 9902620–02300.

***Aristida parvula* (Nees) De Winter**

(=*Stipa parvula* Nees) 1.

Annual; tufted (erect to geniculate to semi-prostrate); to 400(–800) mm tall. Leaf blades to 120 mm long; to 2 mm wide. Spikelets 18–22 mm long (including awns). Glumes unequal, lower to 2/3 the length of the upper

glume (excluding awns), lower glume awned; lemma laterally compressed, articulation between the apex of the lemma and the base of the column; column to 5 mm long, twisted; awn solitary, usually bent; callus tip naked, broad, truncate to rounded, with long hairs at the junction between the lemma and the callus, which are 1/2 the length of the lemma body.

Flowering August to October and January to May (in Namibia). Sandy, stony or gravel soils on gravel plains, along water courses, disturbed areas and rocky hillsides. Locally common. Biome: Nama-Karoo and Desert. Endemic. In the past this species has been included in *Stipa* because of the single awn, but *Stipa* has a membranous ligule. Detailed studies have shown it to be an *Aristida* with the lateral awns missing.

Description: De Winter 1965 (242), Chippindall 1955 (290). Voucher: Oliver, Muller & Steenkamp 6620. PRECIS code 9902620–02400.

***Aristida pilgeri* Henr.**

Robust and coarse perennial; densely tufted; to 1500 mm tall. Leaf blades to 500 mm long; 0.9–4.5 mm wide. Spikelets 10–26 mm long (including awns). Lower internodes glabrous; inflorescence with spikelet clusters linear to oblanceolate (including awns), longest pedicel to 8.5 mm long; lower glume 1/2–2/3 the length of the upper glume, long-awned; lemma articulation between the apex of the lemma and the branching point of the awns, sometimes articulation represented only by a swollen line or colour differentiation; column distinct, to 2.5 mm long; awns three, slightly unequal; callus 0.5–1.5 mm long, tip naked, broadly rounded.

Flowering February to July. Calcareous or sandy, stony soils in moist depressions, along edges of floodplains, on river banks. Locally common. Biome: Savanna. Zimbabwe, Zambia. Indicator (retrogression of veld). Resembles *A. sciurus*, forms of *A. junciformis* subsp. *junciformis* and *A. canescens* subsp. *canescens*, but all these taxa have no lemma articulation.

Description: De Winter 1965 (293). Illustration: Muller 1984 (fig. 35). Voucher: Smith 3834. PRECIS code 9902620–02500.

***Aristida recta* Franch.**

Perennial; occasionally short-ly rhizomatous and tufted (erect); to 500 mm tall (usually shorter). Leaf blades to 200 mm long; to 1 mm wide. Spikelets 10–12 mm long (including awns). Basal leaf sheaths persistent, breaking up into fibres and forming a dense tuft at the base of the culms; inflorescence contracted, branches erect or spreading less than 45 degrees from the main axis; spikelets brownish-purple to deep purple; lower glume to 2/3 the length of the upper glume, awned; lemma articulation absent; column absent, a short beak may be present; awns three, subequal; callus very short, tip naked, large, swollen, rounded.

Flowering September to November. Damp ground around vleis, and seepage areas, usually on slopes of sour mountain grassland. Infrequent to locally common. Biome: Grassland. Tropical Africa.

Description: De Winter 1965 (270), Clayton et al. 1970–1982 (145). Illustration: Chippindall 1955 (fig. 277). Voucher: Kluge 1982. PRECIS code 9902620–02600.



***Aristida rhiniochloa* Hochst.**

(=*A. andoniensis* Henr.) 1.

Skurwe steekgras.

Annual; tufted (erect); to 900 mm tall. Leaf blades to 200 mm long; to 4 mm wide. Spikelets 35–50 mm long (including awns). Plants usually very scabrid, occasionally smooth; spikelets coarse; lower glume usually slightly longer than the upper glume, awn 0.8–3.5 mm long; lemma linear, laterally compressed, articulation absent; column absent; awns three, laterals well developed; callus tip naked, broad, swollen, rounded.

Flowering January to May. Sand to sandy loam, stony to heavier soils, sometimes over calcareous outcrops on dry ground along rocky slopes, gravel plains and eroded areas. Locally common. Biome: Savanna. Northwards to tropical east and west Africa. Indicator (overgrazing, drought and other disturbances).

Description: De Winter 1965 (250), Clayton et al. 1970–1982 (147). Illustration: Muller 1984 (fig. 36). Voucher: Smook 4221, Volk 1251. PRECIS code 9902620–02700.

***Aristida scabrivalvis* Hack. subsp. *contracta* (De Winter)**

Meld.

Annual; tufted (erect to geniculate); to 850 mm tall. Leaf blades to 300 mm long; to 3.2 mm wide. Spikelets 10–25 mm long (including awns). Inflorescence robust, branchlets and pedicels appressed, with spikelets densely congested at the ends of the branches; spikelets slender and fine; lower glume less than 3/4 the length of the upper glume (excluding awns), awn 0.8–3.5 mm long; lemma linear, laterally compressed, articulation absent; column absent; awns three, laterals well developed; callus tip naked, swollen, rounded.

Flowering March to May. Shale, heavy basalt or sandy soils in open and disturbed places on roadsides and hillslopes. Infrequent. Biome: Savanna and Grassland. The species occurs northwards to east Africa. Distinguished from subsp. *scabrivalvis*, which has a more delicate inflorescence with the branchlets spreading and spikelets distant from one another at the ends of the branches. There appears to be a complete gradation between specimens conforming to the 'typical' subsp. *contracta* and specimens that have been referred to as subsp. *borumensis*. Pending a more detailed study, all the specimens are included in subsp. *contracta*. Resembles *A. bipartita*, which is a perennial, and *A. effusa*, which may have a lower glume awn to 0.8 mm.

Description: De Winter 1965 (255). Voucher: Smith 2361, Ellis 524, Smook 4236, 3114. PRECIS code 9902620–02800.

Aristida scabrivalvis* Hack. subsp. *scabrivalvis

Pers steekgras.

Annual; tufted (erect to geniculate); to 850 mm tall. Leaf blades to 200 mm long; to 3.5 mm wide. Spikelets 18–24 mm long (including awns). Inflorescence delicate, branchlets and pedicels spreading, with a few spikelets distant from one another at the ends of the branches; lower glume less than 3/4 the length of the upper glume (excluding awns), awn 0.8–3.5 mm long; lemma linear, laterally compressed, articulation absent; column absent; awns three, laterals well developed; callus tip naked, swollen, rounded.

Flowering January to May. Sandy, sandy loam, clays, often over limestone, usually in disturbed places such as roadsides and old lands. Locally common. Biome: Savanna. Tropical Africa. Distinguished from subsp. *contracta*, which has a more robust inflorescence with branchlets appressed and spikelets clustered at the ends of the branches. Resembles *A. effusa*, which may have a mucro or short awn to 0.8 mm long, and *A. bipartita*, which is perennial.

Description: De Winter 1965 (255), Clayton et al. 1970–1982 (147). Voucher: Giess, Volk & Bleissner 6508. PRECIS code 9902620–02900.

***Aristida sciurus* Stapf**

Tall three-awned grass.

Robust perennial; short rhizomatous and tufted (erect); to 1400 mm tall. Leaf blades to 800 mm long; 2–3(–6) mm wide. Spikelets 25–30 mm long (including awns). Culms 5–6 mm in diameter, unbranched, lower internodes woolly-hairy or glabrous; lower glume 1/2 the length of the upper glume, mucro or awn absent; lemma articulation absent; lemma narrowed into a beak or very short twisted column; awns three, subequal; callus tip small, naked, swollen and rounded.

Flowering January to May. Moist sandy soils mainly in mountain sourveld. Locally common. Biome: Grassland. Endemic. Resembles *A. pilgeri*, which has a lemma articulation, *A. spectabilis*, which has the lower glume membranous for the upper 1/2–2/3, and *A. canescens* subsp. *canescens*, which is a more slender plant with a culm diameter of 1.5–3.0 mm.

Description: De Winter 1965 (273). Voucher: Turner 133, Compton 30594. PRECIS code 9902620–03000.

***Aristida spectabilis* Hack.**

Bergsteekgras.

Perennial; densely tufted; to 1750 mm tall. Leaf blades to 600 mm long; 4–5 mm wide. Spikelets 35–40 mm long (including awns). Lower glume 1/2 the length to nearly as long as the upper glume, firm below, upper 1/3–2/3 membranous and often torn, mucro or awn absent; lemma articulation present between the apex of the lemma and the base of the column; column 4–6 mm long, twisted; awns three, equal to subequal; callus tip naked, emarginate to distinctly bifid.

Flowering February to April. Shallow and sandy soils mainly derived from quartzite on stony, rocky mountain slopes. Infrequent to locally common. Biome: Savanna. Endemic. Resembles *A. meridionalis*, which has the lower glume with only the extreme tip membranous, *A. pilgeri*, which has the articulation between the apex of the column and the branching point of the awns, and *A. sciurus*, which has no articulation.

Description: De Winter 1965 (283). Voucher: Smook 4755. PRECIS code 9902620–03100.

***Aristida stipitata* Hack. subsp. *graciliflora* (Pilg.) Meld.**

(=*A. graciliflora* Pilg.) 1;
(=*A. stipitata* Hack. var.
graciliflora (Pilg.) De Winter) 2.

Langnaaldsteekgras.

Slender perennial; loosely tufted (erect); to 900 mm tall. Leaf blades to 200 mm long; 2–3 mm wide. Spikelets 60–80 mm long (including awns).

Culms 1.0–2.5 mm in diameter, lower internodes glabrous or pubescent, not woolly-hairy; inflorescence narrow, not spikelike, sparse, branches lax, not closely appressed to the main axis; lower glume to 2/3 the length of the upper glume, awned; lemma articulation between the apex of the lemma and base of the column; column present; awns three, laterals well developed; callus 1.5–3.0 mm long, tip naked, acuminate, pungent.

Flowering November to June. Sandy or loamy soils in rocky situations, seepage zones and disturbed ground. Common (widespread). Biome: Savanna. Zimbabwe, Zambia, Mozambique. A polymorphic species which is so variable that it is often difficult to distinguish between the subsp. although the extreme variants are distinct. Resembles *A. mollissima* subsp. *argentea*, which has the lower culm internodes woolly to densely tomentose.

Description: De Winter 1965 (290). Illustration: Muller 1984 (fig. 38). Voucher: Smook 4166, Tinley 609. PRECIS code 9902620–03300.

***Aristida stipitata* Hack. subsp. *robusta* (Stent & Rattray) Meld.**

Robust perennial; tufted; to 1500 mm tall. Leaf blades to 300 mm long; to 4 mm wide. Spikelets 70–90 mm long (including awns). Plants robust, culms 2.5–4.0 mm in diameter; lower internodes glabrous or pubescent, not woolly-hairy; inflorescence narrow, not spikelike, branches lax and not closely appressed to main axis, 200–350 mm long; lower glume to 3/4 the length of the upper glume, awned; lemma articulation between the apex of the lemma and the base of the column; column present; awns three, laterals well developed; callus 1.5–3.0 mm long, tip naked, acuminate, pungent.

Flowering January to April. Deep, heavy sands, often in disturbed areas. Locally common. Biome: Savanna. Zimbabwe, Zambia. A polymorphic species which is so variable that it is often difficult to distinguish between the subspecies although the extreme variants are distinct.

Description: De Winter 1965 (290). Illustration: Muller 1984 (fig. 39). Voucher: Smith 1640. PRECIS code 9902620–03400.

***Aristida stipitata* Hack. subsp. *spicata* (De Winter) Meld.**

Slender perennial; loosely to densely tufted (erect); to 600 mm tall. Leaf blades to 150 mm long. Spikelets 50–100 mm long (including awns). Culms much branched at the upper nodes, lower internodes glabrous or pubescent, not woolly-hairy; inflorescence narrow, dense, spikelike, branches closely appressed to the main axis, sometimes interrupted towards the base, usually to 150 mm long; lower glume to 2/3 the length of the upper glume, awned; lemma articulation between the apex of the lemma and the base of the column; column well developed; awns three, laterals well developed; callus 1.5–3.0 mm long, tip naked, acuminate, pungent.

Flowering February to May. Deep sandy soils associated with rocky outcrops. Locally common. Biome: Savanna. Zambia. A polymorphic species which is so variable that it is often difficult to distinguish between the subspecies although the extreme variants are distinct.

Description: De Winter 1965 (290). Illustration: Muller 1984 (fig. 40). Voucher: Acocks 2159. PRECIS code 9902620–03500.

Aristida stipitata* Hack. subsp. *stipitata

Robust perennial; tufted (erect); to 1500 mm tall. Leaf blades to 300 mm long; to 4 mm wide. Spikelets 50–90 mm long (including awns). Culms sparsely branched at the upper nodes, lower internodes glabrous or pubescent, not woolly-hairy; inflorescence narrow, 150–300 mm long, dense, spikelike, the branches closely appressed to the main axis, sometimes interrupted towards the base; lower glume to 2/3 the length of the upper glume, awned; lemma articulation between the apex of the lemma and the base of the column; column present; awns three, laterals well developed; callus 1.5–3.0 mm long, tip naked, acuminate, pungent.

Flowering December to April. Deep sandy or calcareous soils. Locally common. Biome: Savanna. Zimbabwe, Zambia. Domestic use (thatching), or pasture (pioneer grass of little forage value). A polymorphic species which is so variable that it is often difficult to distinguish between the subspecies although the extreme variants are distinct. Distinguished from *A. mollissima* subsp. *mollissima*, which has the lower internodes woolly.

Description: De Winter 1965 (290). Illustration: Muller 1984 (fig. 37). Voucher: Smook 4310, De Winter 2280. PRECIS code 9902620–03550.

***Aristida stipoides* Lam.**

(=*A. fontismagni* Schweick.) l.

Annual; loosely tufted; to 1500 mm tall. Leaf blades to 300 mm long; 3–5 mm wide. Spikelets 55–75 mm long (including awns). Leaf auricles with long woolly hairs; lower glume lanceolate, 6–9 mm long, to 2/3 the length of the upper glume, apex acute, mucro or awn absent; lemma articulation between the apex of the lemma and the base of the column; column 20–35 mm long; awns three, subequal; callus tip naked, deeply bifid.

Flowering February to May. Damp sandy soils along seasonal floodplains, dry river beds, rocky hillsides, roadsides or old cultivated lands. Locally common. Biome: Savanna. Zambia, west Africa, Ethiopia to Tanzania. Resembles *A. meridionalis*, which is a robust perennial.

Description: De Winter 1965 (286). Illustration: Muller 1984 (fig. 41). Voucher: Smith 1954, Schweickerdt 2129. PRECIS code 9902620–03600.

***Aristida transvaalensis* Henr.**

Rock three-awns.

Perennial; densely tufted; to 700 mm tall. Leaf blades to 150 mm long. Spikelets 15–30 mm long (including awns). Plant branched at all the upper nodes; lower glume (including awns) 2/3 the length of the upper glume, awned; lemma without articulation; column of variable length; central awn sometimes solitary, lateral awns absent or weakly developed being very much shorter and more slender; callus tip naked, swollen, obtuse to truncate.

Flowering December to May. Shallow soils in crevices and pockets on dry rocky outcrops and hillsides. Common. Biome: Savanna. Endemic. Resembles *A. junciformis*



subsp. *junciformis*, which has culms branched but not at every node and lateral awns well developed, and *A. monticola*, which has the lower glume mucronate but unawned.

Description: De Winter 1965 (263). Voucher: Wells 1866, Smook 3056. PRECIS code 9902620-03700.

Aristida vestita Thunb.

Harde steekgras, large woolly three-awn.



Perennial; densely tufted; to 850 mm tall. Leaf blades to 240 mm long; to 4 mm wide. Spikelets 30–50 mm long (including awns). Lower culm internodes pubescent to woolly-hairy, upper internodes pubescent to glabrous; inflorescence narrowly oblong to narrowly elliptic, usually asymmetric, to 200 mm long and 120 mm wide; lower glume to 2/3 the length of the upper glume, awn or mucro absent; lemma articulation between the lemma apex and the base of the column; column 5–7 mm long; awns three, laterals well developed; callus tip naked, distinctly bifid.

Flowering sporadically, but mostly November to May. Dry sandy loam or black clay, limestone soils in stony and rocky veld. Locally common to common. Biome: Savanna and Nama-Karoo. Northwards to Tanzania. Resembles both subspecies of *A. diffusa* and *A. engleri*, which have the lower culm internodes glabrous.

Description: De Winter 1965 (249). Voucher: Smook 3495. PRECIS code 9902620-03800.

Arrhenatherum P. Beauv.

Thorea Rouy, *Thoreochloa* Holub.

Perennial; caespitose. Culms 300–2000 mm high; herbaceous; unbranched above. Leaves without auricles. Leaf blades linear; flat, or rolled (convolute). Ligule an unfringed membrane (sometimes puberulent). Plants bisexual, with bisexual spikelets.

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets 7–11 mm long; compressed laterally; disarticulating above the glumes (the florets falling together). Rachilla prolonged beyond the uppermost female-fertile floret. Callus short. Glumes two; very unequal; about equalling the spikelets to much exceeding the spikelets; awnless; similar (membranous). Incomplete florets proximal to the female-fertile florets, or both distal and proximal to the female-fertile florets. Distal florets when present merely underdeveloped. Proximal incomplete florets 1 or rarely absent.

Female-fertile florets 1 (or rarely 2–4). Lemmas decidedly firmer than the glumes; 5–9 nerved; entire, or incised; awnless, or awned. Awns when present 1; dorsal; non-geniculate (usually short and slender); much shorter than the body of the lemma to about as long as the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary hairy. Fruit small, or medium sized, or large; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooidae; Poodae; Aveneae. 4 species. Europe, Mediterranean. Mesophytic to xerophytic; in open habitats (dry grassland, edges of woods, disturbed ground). Transvaal and Natal. 1 naturalized species.

Intergeneric hybrids with *Avena*.

References. 1. Chippindall. 1955. Gr. & Past. 2. Holub. 1980. Fl. Europ.

Species treatment by T.M. Sokutu.



Fig. 21.

Arrhenatherum elatius

Arrhenatherum elatius (L.) Presl

Fig. 21. Pl. 13.

Perennial; culms solitary; 500–1400 mm tall. Leaf blades 100–190 mm long; 2–5 mm wide. Spikelets 7–11 mm long. Inflorescence usually open, sometimes contracted, branches filiform, conspicuously unequal; awn on lower lemma always conspicuous and well developed; upper lemma with less well developed awn (var. *bulbosum* (Willd.) Spenner) or as developed as the lower one (var. *biaristatum* (Peterm.) Peterm.).

Flowering November to December. Meadows, disturbed places, roadsides and gardens. Infrequent. Naturalized from Europe. Biome: Grassland. Planted pasture. The species is characterized by its conspicuously unequal inflorescence branches, var. *bulbosum* (Willd.) Spenner by its bulbous, corn-like base, var. *biaristatum* (Peterm.) Peterm. by the absence of the above. Few specimens were examined, from which it appears that we may not have records for var. *elatius* (L.) Presl.

Description: Holub 1980 (5:216), Chippindall 1955 (81). Illustration: Chippindall 1955 (fig. 52). Voucher: Huntley 271. PRECIS code 9902000-00100.



Arthraxon P. Beauv.

Alectoria A. Rich., *Batrachium* Nees, *Lasiolytrum* Steud., *Lucaea* Kunth, *Pleuroplitis* Trin.

Annual, or perennial; decumbent. Culms 100–1000 mm high (often trailing); herbaceous; branched above, or unbranched above. Leaf blades linear-lanceolate to ovate-lanceolate; cordate. Ligule a fringed membrane (short). Plants bisexual, with bisexual spikelets. The spikelets of



Fig. 22. *Arthraxon lanceolatus* var. *lanceolatus*

sexually distinct forms on the same plant (usually); overtly heteromorphic, or homomorphic.

Inflorescence of spike-like main branches; digitate or subdigitate (usually subdigitate, rarely a single raceme); espatheate; not comprising 'partial inflorescences' and foliar organs (but the inflorescences terminal and/or axillary). **Spikelet-bearing axes** spikes (rarely), or 'racemes' (slender); clustered; with very slender rachides; disarticulating at the joints. 'Articles' without a basal callus-knob.

Spikelets solitary (rarely), or in pairs; consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations; when paired occurring in pedicellate/sessile combinations. Pedicels when present free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only, or sterile, or vestigial, variable in form, reduced to a sometimes microscopic pedicel, or totally suppressed. Female-fertile spikelets 2–6.5 mm long; compressed laterally; falling with the glumes. Glumes two; more or less equal; awnless; very dissimilar (lower often coriaceous, rounded on the back; upper less firm, laterally compressed). Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire, or incised; awned. Awns 1; median; dorsal; geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present, or absent; when present very reduced. Lodicules 2; fleshy; glabrous. Stamens 2–3. Ovary glabrous. Fruit fusiform, or ellipsoid; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 9$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 7 species. Tropical Africa, Madagascar, Mauritius, Indomalayan region to Japan. Helophytic to mesophytic; in shade, or in open habitats; glycophytic. Transvaal. 1 indigenous species.

References. 1. Van Welzen. 1981. *Blumea* 27: 255. 2. Clayton & Renvoize. 1982. *FTEA*.

Species treatment by G.E. Gibbs Russell.

Arthraxon lanceolatus* (Roxb.) Hochst. var. *lanceolatus

Fig. 22. Pl. 14.

(=*A. prionodes* (Steud.) Dandy) 1.

Perennial; trailing; to 600 mm tall. Leaf blades 20–70 mm long; 4–20 mm wide (margins with tubercle-based hairs). Spikelets (sessile) 5.0–6.5 mm long (pedicellate shorter). Lower glume spiny on keels; female-fertile lemma awned from near base.

Flowering October to April. Riverbanks. Rare and conservation status not known. Biome: Forest. Eastern Africa to India and tropical Asia.

Description: Chippindall 1955 (455), Clayton et al. 1970–1982 (741). Voucher: Stevenson-Hamilton s.n. PRECIS code 9900670–00050.

***Arundinella* Raddi**

Acratherum Link, *Brandtia* Kunth, *Calamochloe* Reichenb., *Goldbachia* Trin., *Riedelia* Kunth, *Thysanachne* Presl.

Annual, or perennial; mostly with tough, erect culms. Culms 300–1500 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat, or rolled. Ligule a fringed membrane (narrow). Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (i.e., with reduced, sterile spikelets), or all alike in sexuality.

Inflorescence paniculate; open, or contracted; *espathate*. *Spikelet-bearing axes persistent*.

Spikelets solitary, or in pairs; consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations. *Female-fertile spikelets* 1.5–8 mm long; *compressed laterally*; disarticulating above the glumes. *Hairy callus present*. Glumes two; very unequal; awned, or awnless; very dissimilar to similar (membranous to papery, G1 acute to mucronate, G2 often caudate). *Lower glume 3 nerved*. Proximal incomplete florets present or rarely absent, these when present 1; paleate, palea fully developed (narrow, two keeled); male.



Fig. 23. *Arundinella nepalensis*

Female-fertile florets 1 (rarely 2). Lemmas similar in texture to the glumes, or decidedly firmer than the glumes (membranous to thinly coriaceous); not becoming indurated; hairless (scabrid or scabridulous); having the margins lying flat and exposed on the palea, or having the margins tucked in onto the palea; *with a clear germination flap*; 1–7 nerved; entire, or incised; awnless, or awned. Awns 1 (usually), or 3; median, or median and lateral (via capillary bristles from the lobes). The median awn different in form from the laterals (when laterals present); from the sinus; geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present (sometimes auriculate at the base, but not keel-winged).

Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Photosynthetic pathway. C_4 . The anatomical organization conventional, or unconventional. Organization of PCR tissue when unconventional *Arundinella* type. Biochemical type NADP-ME (*A. nepalensis*); XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 7, 10, 12$, and 14. Panicoideae; Panicoideae; Arundinelleae. 55 species. In warm regions. Helophytic to mesophytic; in open habitats (marshy places, riverbanks and rocky slopes); glycophytic. Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by H.M. Anderson.

Arundinella nepalensis Trin.

Fig. 23. Pl. 15.

River grass, beesgrass, rietgras.

Perennial; tufted; 900–1500 mm tall. Leaf blades 80–300 mm long; 3–10 mm wide. Spikelets 4–6 mm long. Rhizome creeping, often covered with short scale-like leaves, resulting in a plaited look; panicle dense, 120–300 mm long; spikelets usually in pairs, brown, sometimes tinged with green or purple; glumes unequal and acute; lower lemma with a truncate, hairy callus, awns 3–6 mm long.

Flowering December to March. Vleis, riverbanks and moist grasslands. Locally common. Biome: Savanna and Grassland. Tropical east Africa to Asia. Domestic use (thatching), or pasture (natural).

Description: Chippindall 1955 (275). Illustration: Chippindall 1955 (fig. 247). Voucher: Smook 4999. PRECIS code 9901730–00100.



Arundo L.

Amphidonax Nees, *Donacium* Fries, *Donax* P. Beauv., *Eudonax* Fries, *Scolochloa* Mert. & Koch.

Perennial (*mostly reeds with long canes*); long-rhizomatous. Culms 2000–6000 mm high, or not applicable (occasionally pendant, from cliffs); woody and persistent; branched above (main stems dominant). Leaf blades linear-lanceolate to lanceolate; flat. *Ligule a fringed membrane (short)*.

Inflorescence paniculate (plumose); open; espathate. Spikelet-bearing axes persistent.

Spikelets 12–18 mm long; compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; about equalling the spikelets; awnless; similar (membranous). All florets female-fertile, or with distal incomplete florets, these merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2–7. Lemmas less firm than the glumes, or similar in texture to the glumes (membranous or hyaline); hairy (villous on the back); 3–9 nerved; entire, or incised; awnless to awned. Awns when present 1, or 3; median, or median and lateral. The median awn similar in form to the laterals (when laterals present); from the sinus; non-geniculate; much shorter than the body of the lemma. Palea present; 2-nerved. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; pericarp fused; embryo large.

Photosynthetic pathway. C_3 ; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 12$. Arundinoideae; Arundineae. 3 species. Tropical and temperate. Helophytic to mesophytic.

Botswana, Transvaal, Orange Free State, Natal, and Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by G.E. Gibbs Russell.



Fig. 24. *Arundo donax*

Arundo donax L.

Giant reed, Spaansriet.

Perennial; rhizomatous; to 3000 mm tall. Leaf blades to 700 mm long; to 80 mm wide. Spikelets 8–15 mm long. Robust, not tufted; leaves deciduous at base of blade; blades rounded or caudate at base, tips not sharp; ligule with fringing hairs shorter than membranous base; inflorescence 300–600 mm long, compact with ascending branches; lemmas with long hairs on the back.

Flowering February, or April. Moist disturbed places. Infrequent. Naturalized from warm regions of the Old World; escaped from cultivation. Widely cultivated worldwide. Barrier and ornamental. Easily mistaken for *Phragmites*. It may be distinguished most readily by the very large compact inflorescence. However it seldom flowers in the highveld, and then is best distinguished by the combination of leaf characters.

Description: Chippindall 1955 (229). Illustration: Chippindall 1955 (fig. 203). Voucher: McClean 536. PRECIS code 9902130–00100.

Fig. 24. Pl. 16.



Avena L.

Anelytrum Hack., *Preissia* Opiz.

Annual; caespitose to decumbent. Culms 200–2000 mm high; herbaceous; unbranched above. Leaf blades linear; flat (usually), or rolled (rarely convolute). Ligule an unfringed membrane.

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets not in distinct 'long-and-short' combinations; 10–45 mm long; compressed laterally; disarticulating above the glumes, or not disarticulating (cultivated forms). Glumes two (lanceolate); more or less equal; about equalling the spikelets, or much exceeding the spikelets (rarely shorter); awnless; similar (usually chaffy). Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.

Female-fertile florets (1–)2–6. Lemmas similar in texture to the glumes (rarely), or decidedly firmer than the glumes (usually coriaceous to crustaceous); 5–9 nerved; incised; awnless, or awned. Awns when present 1, or 3; median, or median and lateral. The median awn different in form from the laterals (when laterals present); dorsal; geniculate; much longer than the body of the lemma. Palea present; relatively long, or conspicuous but relatively short, or very reduced (but large). Lodicules 2; membranous; glabrous. Stamens 3. Ovary hairy. Fruit medium sized; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. 27 species. Europe, Mediterranean, North Africa, western Asia. Mesophytic, or xerophytic; in open habitats (mostly in weedy places); glycophytic. Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. Naturalized species (4), cultivated (1).

Intergeneric hybrids with *Arrhenatherum*.

References. 1. Rocha Afonso. 1980. Fl. Europ.

Species treatment by T.M. Sokutu.

- 1(0). Lemmas glabrous or sparsely hairy at the base; central awns straight or weakly geniculate, sometimes absent 2
- Lemmas densely hairy up to awn insertion; central awns strongly geniculate 3
- 2(1). Awns with a distinct column *A. sativa*
- Awns lacking a distinct column *A. byzantina*
- 3(1). Lemma apices awned, awns 4–8 mm long *A. barbata*
- Lemma apices awnless 4
- 4(3). Lemma teeth 1.0–1.5 mm long *A. fatua*
- Lemma teeth to 0.5 mm long *A. sterilis*

Avena barbata Brot.

Annual; culms solitary or tufted; 300–1300 mm tall. Leaf blades 70–300 mm long; 3–10 mm wide. Spikelets 18–26 mm long. Leaf blades soft and expanded; spikelets numerous; lemmas hairy in the lower half, apices awned.

Flowering August to December. Waste and/or disturbed places, roadsides on sandy soil. Locally dominant (disturbed areas in the Cape). Invader from Europe. Biome: Fynbos and Savanna. Ornamental, weed, and domestic use (dried flower arrangements). Variable in plant height and spikelet size, easily distinguished by awns on its lemma apices.

Description: Adams & Salter 1950 (69), Rocha Alfonso 1980 (5:206), Stapf 1898–1900 (480), Chippindall 1955 (81). Voucher: Compton 15370. PRECIS code 9901950–00100.

Pl. 17.



Avena byzantina K. Koch.

Annual; loosely tufted; 500–1600 mm tall. Leaf blades 150–500 mm long; 3–9 mm wide. Spikelets 25–35 mm long. Lemmas glabrous or sometimes sparsely hairy at the base; awn straight or weakly geniculate, without a distinct column.

Flowering September to December. Waste and disturbed areas and roadsides. Indeterminate. Infrequent. Naturalized from Europe. Biome: Fynbos, Savanna and Grassland. Europe. Potential ornamental, or weed. Very similar to *A. sativa* and sometimes not easily distinguished, as the only difference is the distinct column in the awn of *A. sativa*. This species seem to grow together with populations of *A. sativa*.

Description: Rocha Alfonso 1980 (5:207). Voucher: Esterhuysen 609. PRECIS code 9901950–00150.

Avena fatua L.

Annual; culms solitary or loosely tufted; 250–700 mm tall. Leaf blades 50–280 mm long; 3–8 mm wide. Spikelets 18–32 mm long. Spikelets usually brownish in colour, especially on the hairs; lemma apices with teeth usually 1.0–1.5 mm long.

Flowering August to November. Disturbed and waste places, roadsides on sandy soil. Common. Invader from Europe. Biome: Fynbos and Savanna. Europe, north Africa, western and central Asia, introduced to Kenya and Zimbabwe. Weed. Not always easy to distinguish from *A. sterilis*, but the teeth are usually shorter in the latter species.



Fig. 25. *Avena fatua*



Description: Adams. & Salter 1950 (69), Stapf 1898–1900 (479), Chippindall 1955 (81), Clayton et al. 1970–1982 (82). Illustration: Clayton et al. 1970–1982 (fig. 28). Voucher: Gibbs Russell 3942. PRECIS code 9901950–00200.

Avena sativa L.

Oats.

Annual; culms solitary or loosely tufted; 350–1500 mm tall. Leaf blades 100–400 mm long; 3–9 mm wide. Spikelets 17–35 mm long. Lemma sparsely hairy or glabrous, apices emarginate; awn with a distinct column, almost straight, sometimes absent.

Flowering September to November. Waste places, disturbed areas, roadsides. Common (in its habitats). Invader; from Europe. Biome: Fynbos, Savanna and Grassland. Food and drink (cereal crop). This species can be easily confused with *A. byzantina* K. Koch, but can be distinguished by the distinct column of the awns. Three subspecies can be recognized: subsp. *macrantha* (lemma sparsely hairy), subsp. *sativa* (lemma glabrous, unawned) and subsp. *praeagravis* (lemma glabrous, awned).

Description: Adams. & Salter 1950 (69), Stapf 1898–1900 (478), Chippindall 1955 (81). Voucher: Crook 802. PRECIS code 9901950–00300.

Avena sterilis L.

Annual; culms solitary or loosely tufted; 500–1450 mm tall. Leaf blades 200–500 mm long; 4–15 mm wide. Spikelets 20–46 mm long. Lemmas with short rigid hairs on proximal 2/3, apices with teeth to 0.5 mm long, with long hairs on the lower 1/2.

Flowering September to November. Waste places, disturbed areas, mainly on sandy soil. Common (in its habitats). Invader from Europe. Biome: Fynbos. Weed. The distinguishing characters do not always occur together. Sometimes the rigid proximal hairs are missing, but the short teeth are always present. Very much like *A. fatua*. Two subspecies, subsp. *sterilis* (ligule 5–6 mm long, florets up to 5) and subsp. *ludoviciana* (ligule 3 mm long, florets up to 3). Some specimens of this species have previously been wrongly referred to as *A. strigosa*.

Description: Rocha Alfonso 1980 (5:208), Stapf 1898–1900 (479), Clayton et al. 1970–1982 (84). Voucher: Bolus 24908. PRECIS code 9901950–00400.



Axonopus P. Beauv.

Anastrophus Schlecht., *Cabrera* Lag., *Lappogopsis* Steud.

Annual (rarely), or perennial; long-stoloniferous (sometimes mat-forming), or caespitose. Culms 150–1000 mm high (or more?); herbaceous. Leaf blades linear-lanceolate to ovate-lanceolate; flat, or folded. Ligule an unfripped membrane.

Inflorescence of spike-like main branches; digitate or subdigitate (rarely), or non-digitate; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; *adaxial*; compressed dorsiventrally; falling with the glumes. Glumes one per spikelet (membranous); awnless. Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; smooth to striate; becoming indurated, or not becoming indurated (papery to crustaceous); hairless;

having the margins tucked in onto the palea; with a clear germination flap; 4 nerved; entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small, ellipsoid; hilum short; embryo large.

Photosynthetic pathway. C₄; NADP-ME (1 species); XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Panicoideae; Paniceae. 110 species. Tropical South America. Helophytic to mesophytic; in open habitats (savanna, forest clearings, moist and weedy places); glycophytic. Transvaal, Swaziland, Natal and Cape Province. 1 naturalized species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by H.M. Anderson.



Fig. 26. *Axonopus affinis*

Axonopus affinis Chase

(=*A. compressus* sensu Chippind., non (Swartz) Beauv.) 1.

Carpet grass.

Perennial; stoloniferous; 250–600 mm tall. Leaf blades to 200 mm long; to 8 mm wide. Spikelets 2 mm long; 1 mm wide.

Strongly stoloniferous, forming dense swards; culm nodes glabrous; leaf blades rounded at tip; female-fertile (upper) lemma as long as spikelet.

Flowering December to May. Moist and disturbed ground. Infrequent. Naturalized from tropical America. Biome: Savanna. Global. Cultivated pasture and erosion control. The rounded tip of the leaf blade distinguishes this from *Digitaria* species with a similar inflorescence.

Description: Clayton et al. 1970–1982 (446). Illustration: Chippindall & Crook 1976 (130). Voucher: Smook 5526. PRECIS code 9901050–00100.

Fig. 26. Pl. 18.



Bambusa Schreber

Arundarbor Kuntze, *Bonia* Balansa, *Criciuma* Soderstrom & Londoño, *Dendrocalamopsis* (Chia & Fung) Keng f., *Eremocaulon* Soderstrom & Londoño, *Guadua* Kunth, *Ischurochloa* Büse, *Leleba* Nakai, *Lingnania* McClure, *Tetragonocalamus* Nakai — cf. Clayton and Renvoize (1986). Soderstrom and Ellis (1987) refer *Criciuma*, *Eremocaulon* and *Guadua* to their subtribe *Guaduinae*, along with *Olmea*, and place *Tetragonocalamus* in the *Arundinariinae*, but revised generic descriptions adequate for the present purpose are not available.

Perennial. Culms 5000–35000 mm high (rarely to only 2000 cm); woody and persistent. Culms reaching 150 mm in diameter (in 'large' species). Culms branched above. Leaf blades pseudopetiolate; disarticulating from the sheaths. Ligule an unfringed membrane to a fringed membrane.

Inflorescence paniculate; spatheate (with or without foliage leaves). Spikelet-bearing axes persistent.

Spikelets 10–80 mm long; compressed laterally to not noticeably compressed; disarticulating above the glumes. Glumes two; more or less equal; decidedly shorter than the adjacent lemmas; awnless; similar. Proximal incomplete florets present or absent, these 1–3 (? — fewer than 4) when present; sterile.

Female-fertile florets 1–20 ('many'). Lemmas entire; awnless; 9–22 nerved. Palea present; relatively long; with several nerves (about 6–16). Lodicules 3; membranous; ciliate. Stamens 6. Ovary hairy; with a conspicuous apical appendage. The appendage broadly conical, fleshy. Stigmas 3 (usually?). Hilum long-linear; embryo small.

Transverse section of leaf blade. Mesophyll with arm cells; with fusoids. Midrib vascularization complex.

Cytology, classification, distribution. Chromosome base number, $x = 12$. Bambusoideae; Bambusoideae; Bambuseae. About 120 species. Tropical and subtropical Asia, Africa, America. Transvaal, Natal, and Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by G.E. Gibbs Russell.

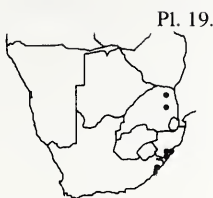
Bambusa balcooa Roxb. ex Roxb.

Bamboo; rhizomatous; 15000–21000 mm tall. Leaf blades to 150 mm long; to 40 mm wide. Spikelets 7–16 mm long. Grows in dense clumps, the culms arching gracefully at the top.

Flowering rare and sporadic. Streambanks and forest margins. Naturalized from India.

Occasionally escaped from cultivation, and distinguished from indigenous bamboos by its great height.

Description: Chippindall 1955 (31). Voucher: Forbes & MacClean 26173. PRECIS code 9904710-00100.

**Bewsia** Goossens

Perennial; caespitose (with short, creeping rhizomes). Culms 260–930 mm high; herbaceous; unbranched above. Leaf blades linear to linear-lanceolate; flat, or rolled (the margins becoming involute under water stress). *Ligule an unfringed membrane (minutely ciliate only)*. The spikelets all alike in sexuality.

Inflorescence of spike-like main branches (appressed to the central axis); with about 10–15 primary inflorescence branches; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; 5.5–9 mm long; compressed laterally (strongly so); disarticulating above the glumes; not disarticulating between the florets. Glumes two; more or less equal; about equalling the spikelets (a little shorter to a little longer); awnless; similar. Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2–6. Lemmas similar in texture to the glumes (membranous); without a germination flap; 3 nerved; entire, or incised (minutely notched); awned. Awns 1; median; dorsal; non-geniculate; much shorter than the body of the lemma to about as long as the body of the lemma (1–4 mm). Palea present; relatively long. Lodicules 2; fleshy (long, narrow); glabrous. Stamens 3. Ovary glabrous. Fruit small (about 2 mm long); linear (to oblong); pericarp fused.

Photosynthetic pathway and related features. C_4 ; $XyMS+$ (the ms thick-walled, sometimes double). PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 1 species. Southern tropical and South Africa. Mesophytic (in grassveld, often on sandy soil); in open habitats. Namibia, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Clayton. 1970. FWTa. 2. Clayton et al. 1974. FTEA. 3. Goossens. 1941. SA Jl. Sci. 37: 183-191.

Species treatment by M. Koekemoer.

Bewsia biflora (Hack.) Goossens

(=*Diplachne biflora* Hack. ex Schinz) 1.

Bloussaadgras.

Perennial; shortly rhizomatous and tufted; 260–930 mm tall. Leaf blades 100–400 mm long; 1–5 mm wide. Spikelets 5.5–9.0 mm long. Spikelets 2–4-flowered; lemma dorsally awned; awn 1–8 mm long, arising 1–2 mm from the tip.

Flowering November to April. Rocky hillsides or plains,

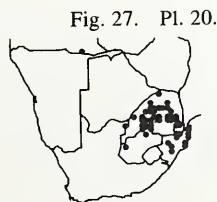


Fig. 27. *Bewsia biflora*

mixed bushveld to open flats. Common. Biome: Savanna and Grassland. Tropical east Africa. Ornamental (in grass gardens). The dorsally awned lemmas in *Bewsia* differ from other Eragrostideae, where the awn arises from the tip of the lemma.

Description: Chippindall & Crook 1976 (176), Goossens 1941 (183), Stapf 1898–1900 (593), Chippindall 1955 (121), Clayton et al. 1970–1982 (286). Illustration: Chippindall 1955 (fig. 92), Clayton et al. 1970–1982 (fig. 78). Voucher: Smook 946. PRECIS code 9903442-00100.

Bothriochloa Kuntze

Amphilophis Nash, *Gymnandropogon* (Nees) Duthie. Sometimes included in *Dichanthium*.

Perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 150–2000 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat. Ligule an unfringed membrane to a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant;



Fig. 28. *Bothriochloa insculpta*

overtly heteromorphic (the pedicellate spikelets smaller, awnless), or homomorphic; all in heterogamous combinations.

Inflorescence of spike-like main branches (many-jointed 'racemes'), or paniculate (rarely: the lower 'racemes' sometimes branched again at the base); digitate or subdigitate (the racemes often almost palmate, towards the culm tips), or non-digitate; spatheate, or espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (with many — more than 8 — sessile spikelets); solitary, or paired, or clustered; with very slender rachides; disarticulating at the joints. The pedicels and internodes of the rachis with a longitudinal, translucent furrow (often villous). 'Articles' without a basal callus-knob.

Spikelets in pairs (with a terminal triplet); consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only, or sterile, awnless. Female-fertile spikelets compressed dorsiventrally; falling with the glumes (and with the joint). Glumes two; more or less equal; awnless; very dissimilar (lower bicarinate, often with a pit on the back; upper narrower, naviculate). Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (reduced to a hyaline stipe); entire; awned. Awns 1; median; apical; geniculate; much longer than the body of the lemma. Palea present, or absent; when present very reduced. Lodicules 2; fleshy; glabrous. Stamens 1–3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 35 species. Warm regions. Mesophytic; in open habitats (grassy places); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. 3 indigenous species.

Intergeneric hybrids with *Capillipedium*, *Dichanthium*.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Lower glumes lacking a pit, with a few long sparse hairs on the lower half ***B. radicans***
Glumes with a deep pit, usually glabrous 2
- 2(1). Inflorescence axis longer than the racemes; racemes more than 20; hairs along sides of pedicels and on callus usually shorter than 1 mm ***B. bladhii***
Inflorescence axis shorter than the racemes; racemes 3–20; hairs along sides of pedicels and on callus 1–3 mm long ***B. insculpta***

Bothriochloa bladhii (Retz.) S.T. Blake

(=*B. glabra* (Roxb.) A. Camus 1; (= *B. insculpta* (A. Rich.) A. Camus var. *vegetior* (Hack.) C.E. Hubb.) 1.

Blouklosgras, purple plume grass.



Perennial; tufted; 600–1800 mm tall. Leaf blades 100–550 mm long; 2–12 mm wide. Spikelets (sessile) 3–4 mm long. Inflorescence axis longer than racemes; racemes more than 20, pedicel and callus hairs usually shorter than 1 mm; lower glumes pitted.

Flowering December to June. Riverbanks and vleis. Common. Biome: Savanna and Nama-Karoo. Old World tropics. Hybridizes readily with related species.

Description: Chippindall 1955 (483), Clayton et al. 1970–1982 (719). Voucher: Schoenfelder 95. PRECIS code 9900630–00100.

Bothriochloa insculpta (A. Rich.) A. Camus

Fig. 28. Pl. 21.

(= *B. pertusa* auct., non (L.) A. Camus) 1.

Pinhole grass, klosgras, stippeelgras.

Perennial; sometimes stoloniferous; to 1500 mm tall. Leaf blades 40–300 mm long; 2–8 mm wide. Spikelets (sessile) 4.5–5.0 mm long. Inflorescence axis shorter than racemes; racemes 3–20, pedicel callus hairs 1–3 mm long; lower glumes pitted.

Flowering October to June. Grassland and hillsides, often in overgrazed places. Common. Biome: Savanna and Grassland. Throughout Africa.

Description: Chippindall 1955 (483), Clayton et al. 1970–1982 (720). Voucher: Liebenberg 4382. PRECIS code 9900630–00150.

**Bothriochloa radicans** (Lehm.) A. Camus

Perennial; often stoloniferous; 300–700 mm tall. Leaf blades 60–200 mm long; 2–6 mm wide. Spikelets (sessile) 3–5 mm long. Inflorescence axes shorter than racemes, racemes 5–16, lower glume of sessile spikelets sparsely hairy, glumes not pitted.

Flowering October to April. Rocky hillsides. Common. Biome: Savanna and Grassland. North to Ethiopia, introduced to tropical America.

Description: Chippindall 1955 (482), Clayton et al. 1970–1982 (721). Illustration: Chippindall 1955 (fig. 395). Voucher: De Winter 2824. PRECIS code 9900630–00500.

**Brachiaria** (Trin.) Griseb.

Pseudobrachiaria Launert.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 70–2000 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear to ovate-lanceolate; flat, or folded, or rolled. Ligule an unfringed membrane, or a fringed membrane, or a fringe of hairs. Plants bisexual, with bisexual spikelets.

Inflorescence of spike-like main branches; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary, or in pairs (or occasionally in fascicles); biseriate; not in distinct 'long-and-short' combinations; broadly elliptic, plump, more or less obtuse; awnless, muticous; adaxial (or orientation ambiguous); not noticeably compressed (rarely), or compressed dorsiventrally; falling with the glumes. Glumes two; very unequal, or more or less equal (rarely); awnless; very dissimilar (the upper similar to L1). Proximal incomplete florets 1; paleate, or epaleate; male, or sterile.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (crustaceous to subcoriaceous); striate, or rugose (and rarely smooth); becoming indurated, or not becoming indurated; hairless (smooth or tuberculate); having the margins tucked in onto the palea; with a clear germination flap; 3–5 nerved; entire; awnless, pointed or apiculate but not mucronate. Palea present (the tip not reflexed); relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Photosynthetic pathway. C₄; PCK (12 species, including *Pseudobrachiaria*); XyMS+. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 7$ and 9. Panicoideae; Panicoideae; Paniceae. About 100 species. Warm regions. Helophytic, or mesophytic, or xerophytic; mostly in open habitats, or in shade (diverse habitats, from semidesert to swamps). Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho and Cape Province. Indigenous species (19), naturalized species (1).

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA. 3. Scholz. 1978. Willdenowia 8:383.

Species treatment by M. Koekemoer.



Fig. 29. *Brachiaria serrata*

- 1(0). Inflorescences with pedicels of unequal lengths, at least some spikelets borne on long slender pedicels exceeding 2 mm; spikelets mostly more than their own length apart 2
 Inflorescences with pedicels of equal lengths, spikelets almost sessile or borne on pedicels shorter than 1 mm; spikelets overlapping for at least 1/4 their length 4
- 2(1). Leaf blades with a cordate, pseudopetiolate base; racemes usually fewer than 5, lax and widely spaced; a coastal, bushland or forest grass that rarely occurs inland **B. chusqueoides**
 Leaf blades linear or rounded at the base; racemes more than 5, stiff and arranged in a broadly ovate panicle; wooded grassland species 3
- 3(2). Spikelets 2.0–3.5 mm long; upper lemma finely rugose **B. deflexa**
 Spikelets 3.5–4.2 mm long; upper lemma coarsely rugose **B. grossa**
- 4(1). Racemes not conspicuously secund; spikelets clustered; racemes mostly appressed to the central axis or spreading slightly 5
 Racemes very conspicuously secund; spikelets usually arranged in one or two rows (rarely four); racemes rarely appressed 6
- 5(4). Plant covered with soft, short, velvety, white hairs; rachilla extension short **B. glomerata**
 Plant with very dense, long, golden hairs all over; rachilla extension absent **B. psammophila**
- 6(4). Lower glumes distinctly darker at the base, tightly clasping a short internode that separates the lower and upper glume; lower glumes very variable but at least some are long acuminate and 1/2–2/3 the spikelet length; upper glume and lower lemma also acuminate **B. nigropedata**
 Lower glumes rarely with a distinctive colour difference, not clasping the short internode between the glumes; lower glumes truncate, rounded (or acute when scale-like), to 2/3 the spikelet length; upper glume and lower lemma usually truncate or rounded, but sometimes mucronate 7
- 7(6). Lower glume 2/3 the spikelet length, 7–9-nerved, usually glabrous; cross-veins present between nerves of upper glume and lower lemma 8
 Lower glume less than half the spikelet length, mostly 1–3-nerved (5-nerved in *B. xantholeuca*, 7-nerved in *B. brizantha*); cross-veins absent on upper glume and lower lemma 11
- 8(7). Upper and lower glume separated by a short internode; spikelets 4.5–7.0 mm long 9
 Upper and lower glume not separated; spikelets 2.8–4.5 mm long 10
- 9(8). Racemes 4–12; plants densely tufted with a creeping rhizome; culms erect **B. dictyoneura**
 Racemes 1–4; plants stoloniferous and rooting at the nodes; culms often decumbent .. **B. humidicola**
- 10(8). Leaf blades filiform, usually up to half the length of the culms, rarely hairy **B. subulifolia**
 Leaf blades flat or sometimes convolute, usually much less than half the length of the culms, usually hairy **B. bovonei**
- 11(7). Lower glume 7-nerved, separated from the upper glume by a short internode; spikelets 4–6 mm long, arranged in a single row (occasionally two rows near the base) **B. brizantha**
 Lower glume 1–5-nerved, not separated from the upper glume; spikelets 1.5–5.0 mm long, arranged in one, two or four rows 12
- 12(11). Lower glume 3–5-nerved, 1/2 the spikelet length, not scale-like 13
 Lower glume 1-nerved or unobtrusively nerved, usually 1/4 the spikelet length (rarely to 1/2 the length), scale-like 15

- 13(12). Plants annual; spikelets 2.7–4.0 mm long; leaf blades flat, broadly linear to narrowly lanceolate, 4–10 mm wide, velvety pubescent **B. xantholeuca**
 Plants perennial; spikelets 4–5 mm long; leaf blades convolute and wiry, 1–3 mm wide, glabrous .. 14
- 14(13). Spikelets glabrous; occurs in Namibia and Botswana **B. dura var. dura**
 Spikelets densely pilose; known only from Witsand (Hay district) **B. dura var. pilosa**
- 15(12). Spikelets arranged in four rows, sparsely hairy with distinct tufts of erect, stiff hairs near the apex on either side of the upper glume and lower lemma, usually between the first and second nerve **B. marlothii**
 Spikelets arranged in two rows, without distinct tufts of hairs 16
- 16(15). Rachis of racemes flat, ribbon-like, broadly winged, 1.0–1.9 mm wide; spikelets glabrous **B. arrecta**
 Rachis of racemes solid, triquetrous or crescentric, sometimes very narrowly winged, less than 1 mm wide; spikelets sparsely or densely hairy ... 17
- 17(16). Lower lemma and palea extending into a short stout mucro, up to 1 mm long; spikelets with dense, white or purple, long hairs concentrated at the apex **B. serrata**
 Lower lemma acute or rounded; palea rounded at the tip; spikelets sparsely pilose or covered in dense silky hairs all over 18
- 18(17). Spikelets very densely hairy; hairs long, white and silky; rachis very delicate and usually bare for the lowest part; panicle mostly simple **B. schoenfelderi**
 Spikelets sparsely pilose; hairs short; rachis delicate or firm, with or without spikelets on the lowest part; panicle simple or compound ... 19
- 19(18). Panicle compound with racemes attached to primary branches (at least in the lower part); lowest part of rachis bare; spikelets bearded at the apex **B. malacodes**
 Panicle simple with racemes attached to the central axis; spikelets covering the whole length of the rachis; spikelets not bearded at the apex ... 20
- 20(19). Spikelets longer than 3 mm, distinctly flattened on the inner side; central axis and rachis firm ... **B. advena**
 Spikelets shorter than 3 mm, not distinctly flattened; central axis and rachis very delicate **B. eruciformis**

Brachiaria advena Vickery

Perennial, or annual; very loosely tufted, or stoloniferous (occasionally); 200–800 mm tall. Leaf blades 50–130 mm long; 2–6 mm wide. Spikelets 3.0–3.8 mm long. Culms erect or decumbent and rooting at the nodes, sometimes straggly; panicle simple; racemes secund, 10–30 mm long; spikelets arranged in two rows, sparsely pilose, distinctly flattened on the inner side, pedicels equal.

Flowering December to March. Usually in damp, disturbed areas on black clayey soil, often in mealie or sunflower fields. Infrequent to locally common. Biome: Savanna and Grassland. Naturalized from Australia. Weed (of



cultivation). Resembles *B. eruciformis*, which has a panicle with a delicate appearance and shorter spikelets that are not distinctly flattened on the one side, and *B. malacodes*, which has a compound panicle.

Description: Chippindall 1955 (377). Voucher: Smook 4686. PRECIS code 9901040-00100.

***Brachiaria arrecta* (Dur. & Schinz) Stent**

(=*B. latifolia* Stapf) 2.

Perennial; hydrophyte, or stoloniferous, or tufted (prostrate and rooting at the nodes); 500–1300 mm tall. Leaf blades 50–250 mm long; 5–15 mm wide. Spikelets 3.0–4.3 mm long. Racemes secund, 10–50 mm long; rachis flat and ribbon-like, broadly winged, 1.0–1.9 mm wide; spikelets glabrous, arranged in two rows, pedicels equal; lower glume 1-nerved, less than 1/2 the spikelet length.

Flowering December to June. In shallow water of river floodplains or vleis, but also extending to areas around rivers and lakes, often in the shade and usually on wet soils. Locally common. Biome: Savanna and Grassland. Tropical east Africa. Introduced to tropical America. The flat ribbon-like rachis distinguishes this from other *Brachiaria* species with spikelets arranged in two rows and 1-nerved lower glumes. Some specimens have previously been wrongly identified as *B. rugulosa*.

Description: Stapf 1898–1900 (393), Chippindall 1955 (374), Clayton et al. 1970–1982 (585). Voucher: Smook 1920, De Winter & Marais 4912. PRECIS code 9901040-00200.

***Brachiaria bovonei* (Chiov.) Robyns**

Wiry signal grass.

Perennial; densely tufted; 250–1000 mm tall. Leaf blades 30–300 mm long; 3–6 mm wide. Spikelets 3.2–4.5 mm long. Leaf blades flat or sometimes convolute, usually much less than 1/2 the length of the culms, usually hairy; racemes secund, 10–30(–50) mm long; spikelets arranged in two rows, pedicels equal; lower glume 2/3 the spikelet length, 7-nerved; cross-veins present on upper glume and lower lemma.

Flowering October to January. In wet, marshy or damp areas around vleis, dams or streams in open veld or on mountain slopes, usually on sandy soils. Infrequent to locally common. Biome: Savanna and Grassland. Southern tropical Africa. Very similar to *B. subulifolia*, which has filiform leaf blades that can be up to 1/2 the culm length.

Description: Chippindall & Crook 1976 (129), Clayton et al. 1970–1982 (582). Voucher: Liebenberg 2805. PRECIS code 9901040-00250.

***Brachiaria brizantha* (A. Rich.) Stapf**

Broodsinjaalgras; common signal grass.

Perennial; loosely tufted (often robust); 300–2000 mm tall. Leaf blades 100–400 mm long; 7–20 mm wide. Spikelets 4–6 mm long. Racemes secund, 25–100 mm long; spikelets arranged in a single row or occasionally with two rows near the base, pedicels equal; lower glume 7-nerved, less than 1/2 the spikelet length, separated from the upper glume by a short internode.

Flowering October to May. Prefers undisturbed areas near streams, especially under trees in open woodland,

usually in sandy or rich soils. Common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical Africa. Palatable pasture (good forage value). Distinguished from other *Brachiaria* species by the 7-nerved lower glume that is separated from the upper glume by a short internode.

Description: Chippindall & Crook 1976 (125), Stapf 1920 (531), Launert 1970 (160:40), Stapf 1898–1900 (386), Chippindall 1955 (371), Clayton et al. 1970–1982 (587). Voucher: De Winter 3913. PRECIS code 9901040-00300.

***Brachiaria chusqueoides* (Hack.) Clayton**

(=*Panicum chusqueoides* Hack.) 2.

Annual; tufted (scandent or creeping); 300–750 mm tall. Leaf blades 30–120 mm long; 3–10 mm wide. Spikelets 3–5 mm long. Leaf blades cordate and pseudopetiolate at the base; racemes usually fewer than 5, lax and widely spaced, 15–70 mm long; spikelets more than their own length apart; pedicels of unequal lengths.

Flowering October to April. Forest undergrowth in disturbed or more open places, frequently in coastal dune forest, on deep sand or humiferous soil. Common. Biome: Savanna. Northwards into tropical east Africa. Resembles *B. grossa*, which lacks pseudopetiolate leaf blade bases, has more racemes and grows in Namibia, Botswana and northern Transvaal, and similar to *B. deflexa*, which usually has smaller spikelets and lacks pseudopetioles.

Description: Clayton et al. 1970–1982 (590). Voucher: Anderson 37. PRECIS code 9901040-00350.

***Brachiaria deflexa* (Schumach.) C.E. Hubb. ex Robyns**

Fig. 30. Pl. 23.

(=*Pseudobrachiaria deflexa* (Schumach.) Launert) 2.

False signal grass, bastersinjaalgras.

Annual; loosely tufted (culms often weak and ascending, solitary or branched); 150–700 mm tall. Leaf blades 40–180(–250) mm long; 4–22 mm wide. Spikelets 2.0–3.4 mm long. Panicle broadly ovate, branches rigid, simple or compound; racemes 7–15, 20–100 mm long, pedicels unequal, the longer one up to 15 mm long; upper lemma finely rugose.

Flowering December to June. Shady places in open woodland or forest margins, often ruderal in disturbed areas. Common. Biome: Savanna, Grassland, Nama-Karoo, and Desert. Northwards to Senegal and Yemen with a few records from India. Formerly placed in a separate genus *Pseudobrachiaria*, but because of its very close relationship with *B. grossa*, which has larger spikelets and a coarsely rugose upper lemma, and with *B. chusqueoides*, which has pseudopetiolate leaf blades, this species is retained in *Brachiaria* pending further research.

Description: Chippindall & Crook 1976 (122), Muller 1984 (212), Chippindall 1955 (378), Clayton et al. 1970–1982 (598). Illustration: Chippindall 1955 (fig. 323). Voucher: Smook 1138. PRECIS code 9901040-00380.

***Brachiaria dictyoneura* (Fig. & De Not.) Stapf**

Perennial; densely tufted and rhizomatous; 300–1200 mm tall. Leaf blades 50–300 mm long; 3–10(–30) mm wide. Spikelets 5–7 mm long. Racemes 4–12, secund, 10–80 mm long; spikelets arranged in two rows, pedicels equal; lower glume more than 2/3 the spikelet length, 7–9-nerved,

separated from upper glume by a short internode; upper glume and lower lemma with cross-veins between the nerves.

Flowering November to March. Usually in bush or mixed mopane veld or along roadsides in damp ditches. Infrequent. Biome: Savanna. Tropical Africa to Ethiopia. Closely related to *B. humidicola*, which has fewer racemes, is stoloniferous and has culms often decumbent and rooting at the nodes.

Description: Stapf 1920 (512), Launert 1970 (160:39), Chippindall 1955 (372), Clayton et al. 1970–1982 (582). Voucher: Anderson 51. PRECIS code 9901040–00400.

Brachiaria dura* Stapf var. *dura

Perennial; rhizomatous (rhizome short, oblique); 400–1500 mm tall. Leaf blades 100–350 mm long, convolute and wiry; 1–3 mm wide. Spikelets 4–5 mm long. Racemes secund, (1–)2, 90–120 mm long; spikelets glabrous, in one or two rows, pedicels equal; lower glume 1/2 the spikelet length, 4-nerved.



Flowering December to May. On dunes or sandy soil along dry rivers and floodplains, often in the shade. Locally common. Biome: Savanna. Northwards to Guinea. Distinguished from var. *pilosa* by spikelet vestiture and distribution. Similar to *B. xantholeuca*, which is annual, has smaller spikelets and broader leaf blades.

Description: Stapf 1920 (531), Launert 1970 (160:40). Voucher: Maguire 2206. PRECIS code 9901040–00500.

***Brachiaria dura* Stapf var. *pilosa* J.G. Anders.**

Perennial; rhizomatous (rhizome usually deeply buried); 500–1300 mm tall. Leaf blades 100–350 mm long, convolute and wiry; 1–3 mm wide. Spikelets 4–5 mm long. Racemes (1–)2(–3), secund, 90–120 mm long; spikelets densely pilose, in one or two rows, pedicels equal; lower glume 1/2 the spikelet length, 3–4-nerved.



Flowering December to April. At Witsand on white sand dunes. Rare. Locally common (Witsand). Biome: Savanna. Distinguished from var. *dura* by spikelet vestiture and distribution. Similar to *B. xantholeuca*, which is annual, has smaller spikelets and broader leaf blades.

Description: Anderson 1961 Kirkia 1 (104). Voucher: Leistner 1372. PRECIS code 9901040–00600.

***Brachiaria eruciformis* (J.E. Sm.) Griseb.**

Litjiesinjalgras; sweet signal grass.

Annual; loosely tufted (sometimes straggly or procumbent); 100–500(–1000) mm tall. Leaf blades 20–150 mm long; 2–6 mm wide. Spikelets 1.7–2.7 mm long. Culms erect or decumbent and rooting at the nodes; racemes secund, 10–25(–30) mm long; spikelets sparsely pilose, arranged in two rows, pedicels equal.



Flowering November to May. In moist places on clay or black turf and in disturbed areas. Common. Biome: Savanna, Grassland, and Nama-Karoo. Northwards to the Mediterranean and then eastwards to India, naturalized in U.S.A. Indicator (waterlogged soils), or weed (in gardens and cultivations). Resembles *B. advena*, which has longer spikelets that are distinctly flattened on the inner side and has panicles with firm, stout central axes and rachises.

Description: Chippindall & Crook 1976 (123), Launert 1970 (160:42), Chippindall 1955 (376), Clayton et al. 1970–1982 (590). Voucher: Leistner 1243. PRECIS code 9901040–00700.

***Brachiaria glomerata* (Hack.) A. Camus**

Annual; loosely tufted (decumbent, sometimes rooting from the lower nodes); 100–300(–600) mm tall. Leaf blades 50–130 mm long; 5–10(–18) mm wide. Spikelets 2–4 mm long. Plants covered with soft, white, velvety hairs; racemes not conspicuously secund, appressed to the central axis, 20–30 mm long; spikelets densely clustered around the rachis, pedicels equal but inconspicuous; rachilla extension short and stalk-like.



Flowering December to June. On red sand dunes or sandy patches on granite outcrops, also in dry water courses. Locally common. Biome: Savanna, Nama-Karoo, and Desert. ?Endemic. Closely related to *B. psammophila*, which is golden-hairy and lacks a rachilla extension. Giess 13422 and a few other specimens might represent another taxon with larger, loosely arranged spikelets that combine the short velvety hairs and rachilla extension of *B. glomerata* with the robust habit of *B. psammophila*.

Description: Launert 1970 (160:40), Stapf 1898–1900 (393), Chippindall 1955 (379). Illustration: Chippindall 1955 (fig. 324). Voucher: Jensen 249; Giess 13422. PRECIS code 9901040–00900.

***Brachiaria grossa* Stapf**

Annual; tufted (with few basal leaves); 300–1000(–1500) mm tall. Leaf blades 50–300 mm long; 4–15(–20) mm wide. Spikelets 3.0–4.2 mm long. Leaf blades oblique and rounded at the base; panicle broadly ovate; racemes 5–12, rigid, 30–100 mm long; spikelets spaced, appearing loosely continuous; pedicels of unequal lengths; upper lemma coarsely rugose.



Flowering January to April. In sandy pockets of soil on granite outcrops or on rocky mountain slopes, also around pans or rivers, occasionally in the shade. Infrequent and locally common. Biome: Savanna. North to Tanzania. Pasture (seldom cultivated), or weed (in lucerne but not very common). Very closely related to *B. chusqueoides*, which has cordate, pseudopetiolate leaves and grows in Natal and the Cape, and to *B. deflexa*, which is a smaller plant with smaller spikelets.

Description: Stapf 1920 (547), Chippindall 1955 (379), Clayton et al. 1970–1982 (597). Voucher: Giess, Volk & Bleissner 5712. PRECIS code 9901040–01000.

***Brachiaria humidicola* (Rendle) Schweick.**

Creeping signal grass; kruip-sinjalgras.

Stoloniferous (culms procumbent except for flowering parts); 400–1100 mm tall. Leaf blades 40–250 mm long; 3–16 mm wide. Spikelets 4.5–6.0 mm long. Racemes 1–4, widely spaced, secund, 25–55 mm long; spikelets in 1–2 rows, pedicels equal; lower glume more than 2/3 the spikelet length, 7-nerved, separated from the upper glume by a short internode; upper glume and lower lemma with cross-veins between the nerves.



Flowering December to May. Favours wet areas such as vleis edges or seasonally swampy grassland but also extends into woodlands, usually on sandy soils. Infrequent to locally common. Biome: Savanna and Grassland. Tropical Africa to Sudan and Ethiopia. Erosion control (roadsides). Closely related to *B. dictyoneura*, which has more racemes and is densely tufted with a creeping rhizome and erect culms.

Description: Chippindall & Crook 1976 (126), Launert 1970 (160:39), Chippindall 1955 (372), Clayton et al. 1970–1982 (583). Illustration: Chippindall 1955 (fig. 319). Voucher: Smith 2636. PRECIS code 9901040–01100.

***Brachiaria malacodes* (Mez & K. Schum.) Scholz**

(=*B. poaeoides* Stapf) 3.

Annual; very loosely tufted (culms usually erect but often decumbent and rooting at the nodes, few basal leaves); 200–850 mm tall. Leaf blades 50–180 mm long; 4–11 mm wide. Spikelets 2.0–3.7 mm long. Panicle compound, branching at least in the lower part, branches filiform, lax and bare for about half their length; racemes 5–25 mm long, secund; spikelets sparsely pilose, bearded at the apex, arranged in two rows.

Flowering February to May. In forests or open mopane woodland on sand or black clay in vleis, often in seasonally wet depressions. Locally common. Biome: Savanna. Angola. Valuable pasture (Namibia). Related to *B. advena* and *B. eruciformis*, which have unbranched panicles.

Description: Stapf 1919 (554), Chippindall 1955 (377). Illustration: Chippindall 1955 (fig. 322). Voucher: Smook 5086. PRECIS code 9901040–01170.

***Brachiaria marlothii* (Hack.) Stent**

Usually annual; stoloniferous, or tufted (decumbent and rooting from the lower nodes); 70–500 mm tall. Leaf blades 10–140 mm long; 1–5 mm wide. Spikelets 2.0–2.5 mm long. Racemes secund, 25–50 mm long; spikelets arranged in four rows, sparsely hairy on the nerves, with very distinct tufts of hairs in the upper half on either side of the upper glume and lower lemma; pedicels equal.

Flowering December to May. Most frequently in disturbed or heavily grazed areas on shallow sand or loam near dams or in seasonally moist spots. Common. Biome: Savanna, Grassland, and Nama-Karoo. Pasture (good fodder for sheep), or weed (can be a nuisance in lawns and gardens).

Description: Launert 1970 (160:41), Stapf 1898–1900 (390), Chippindall 1955 (376). Voucher: Smook 2882. PRECIS code 9901040–01200.

***Brachiaria nigropedata* (Fical. & Hiern) Stapf**

Wurmsinjalgras; spotted signal grass.

Perennial; densely tufted and rhizomatous (rhizome long and creeping); 300–1200 mm tall. Leaf blades to 300 mm long; 5–9 mm wide. Spikelets 3–4 mm long. Racemes secund, 15–30(–40) mm long; spikelets in two rows, pedicels equal; lower glume acuminate but very variable in the same inflorescence, distinctly darker coloured at the base and clasping the short internode between the two glumes; upper glume and lower

lemma also acuminate.

Flowering November to April. Open veld or bush on rocky slopes or among rocks, usually on sandy or well-drained soils. Common (usually scattered but sometimes forming dense stands). Biome: Savanna and Nama-Karoo. Southern tropical Africa with interrupted northern extensions. Palatable pasture (with good forage value). Fairly easily distinguished from other *Brachiaria* species by the tightly clasping lower glume that is dark coloured below and often long-acuminate.

Description: Chippindall & Crook 1976 (128), Stapf 1920 (535), Launert 1970 (160:42), Stapf 1898–1900 (388), Chippindall 1955 (374), Clayton et al. 1970–1982 (587). Illustration: Chippindall 1955 (fig. 320). Voucher: Smook 4871, Story 6127. PRECIS code 9901040–01300.

***Brachiaria psammophila* (Welw. ex Rendle) Launert**

Annual; tufted (erect or decumbent with few basal leaves); 250–400 mm tall. Leaf blades 40–130 mm long; 7–13 mm wide. Spikelets 3.0–4.5 mm long. Plant covered with very dense, long golden-yellow hairs; racemes not conspicuously secund, 10–30 mm long, mostly appressed to the central axis; spikelets clustered, lacking a conspicuous rhachilla extension; pedicels equal.

Flowering November, March, and April. On sand dunes or in dry river beds. Rare and conservation status not known. Biome: Savanna and Desert. Angola. Closely related to *B. glomerata*, which is covered with short velvety hairs and has spikelets with a conspicuous rhachilla extension.

Description: Launert 1970 (160:41). Voucher: Merxmüller & Giess 30661. PRECIS code 9901040–01500.

***Brachiaria schoenfelderi* C.E. Hubb. & Schweick.**

Annual, or perennial; occasionally stoloniferous, or tufted (culms branching at the base, often decumbent and rooting at the nodes); 300–800 mm tall. Leaf blades 30–120(–150) mm long; 3–8 mm wide. Spikelets 2.0–3.4 mm long. Racemes secund, 10–35 mm long, often incurved, lower racemes often bare in the lower part; rachis delicate and lax; spikelets very densely pilose, arranged in 2 rows; pedicels equal.

Flowering February to May. In gravelly and black vlei soil in depressions, in mopane veld or bushveld. Locally common (plants usually scattered amongst other grasses). Biome: Savanna. Distinguished from *B. malacodes*, *B. advena* and *B. eruciformis* by its very densely hairy spikelets.

Description: Launert 1970 (160:41), Chippindall 1955 (378). Voucher: Smook 5119. PRECIS code 9901040–01600.

***Brachiaria serrata* (Thunb.) Stapf**

(=*B. serrata* (Thunb.) Stapf var. *serrata*) 2; (=*B. serrata* (Thunb.) Stapf var. *gossypina* (A. Rich.) Stapf) 2.

Red top grass; rooisinjalgras.

Perennial; tufted (densely or loosely), or rhizomatous; 300–750 mm tall. Leaf blades 50–250 mm long; 2–10 mm wide. Spikelets 2.3–4.5 mm long. Vegetative parts very variable; leaves can be in a dense tuft at the base or cauline, leaving

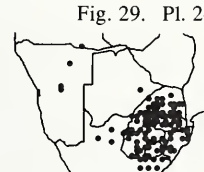
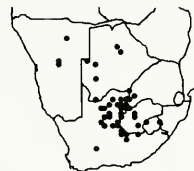


Fig. 29. Pl. 24.

the base bare; culms single or profusely branched, racemes secund, 10–25 mm long; spikelets with dense, long, silky, white or purple hairs concentrated at the apex; pedicels equal; lower lemma and palea extending into a short stout mucro up to 1 mm long.

Flowering October to May. On shallow sandy soil, usually in rocky areas or on mountain slopes but extending into open bush, grassland and occasionally to vlei edges. Common. Biome: Fynbos, Savanna, and Grassland. Northwards into tropical Africa. Pasture (average forage value). The mucronate lower lemma and palea, serrate leaf margins and concentration of hairs on the spikelet apex distinguish this species from *B. arrecta*, *B. dura* and *B. xantholeuca*, which all also have 1-nerved lower glumes



Fig. 30. *Brachiaria deflexa*

and spikelets arranged in two rows. Previously a var. *gossypina* was recognized, which has a distinctly different habit and leaves, but further study is needed to establish if this is a distinct taxon.

Description: Chippindall & Crook 1976 (124), Stapf 1920 (537), Stapf 1898–1900 (388), Chippindall 1955 (375), Clayton et al. 1970–1982 (588). Illustration: Chippindall 1955 (pl. 12(II)). Voucher: Smook 4849. PRECIS code 9901040–01700.

Brachiaria subulifolia (Mez) Clayton

(=*B. filifolia* Stapf) 2.

Perennial; rhizomatous (rhizome oblique), or tufted (erect); 200–1000 mm tall. Leaf blades 50–200 mm long; filiform, 0.7–1.0 mm wide. Spikelets 2.8–4.0 mm long. Leaf blades usually up to half the length of the culms, usually glabrous; racemes secund, 10–30 mm long; spikelets arranged in 2 rows; pedicels equal; lower glume 2/3 the spikelet length, 7-nerved, cross-veins present on upper glume and lower lemma.

Flowering September to November. Frequently in damp or seepage areas on sandy soils. Rare and conservation status not known. Infrequent. Biome: Savanna and Grassland. Northwards into east Africa. Very similar to *B. bovinei*, which has flat or convolute leaf blades that are hairy and much shorter than the culms.

Description: Chippindall 1955 (373), Clayton et al. 1970–1982 (582). Voucher: De Winter & Codd 164. PRECIS code 9901040–01850.

Brachiaria xantholeuca (Schinz) Stapf

Annual; tufted (culms decumbent and branching at the lower nodes); 200–600 mm tall. Leaf blades 30–150 mm long; 4–10 mm wide. Spikelets 2.7–4.0 mm long. Leaf blades broadly linear to narrowly lanceolate, velvety pubescent; racemes secund, 20–70 mm long; spikelets arranged in 2 rows; pedicels equal; lower glume 3-nerved, 1/2 the spikelet length.

Flowering November to March. Among trees, usually near water in sandy loam or clayey soils, often in overgrazed and disturbed places. Locally common. Biome: Savanna. Tropical Africa. Weed (in some areas). Closely related to *B. dura*, which is perennial with larger spikelets and narrower leaf blades.

Description: Stapf 1920 (541), Launert 1970 (160:42), Clayton et al. 1970–1982 (597). Voucher: Smook 4778. PRECIS code 9901040–01900.

Brachyachne (Benth.) Stapf

Annual, or perennial; long-stoloniferous, or caespitose. Culms 80–700 mm high; herbaceous. Leaf blades linear; flat, or rolled (involute and filiform). Ligule a fringed membrane to a fringe of hairs.

Inflorescence of spike-like main branches; digitate or subdigitate; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; *subsessile*; compressed laterally; disarticulating above the glumes. *Hairy callus present*. Glumes two; more or less equal; awnless; very dissimilar (thinly leathery, lower curved, upper straight). All florets female-fertile, or a single distal incomplete floret



also present; *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas less firm than the glumes to similar in texture to the glumes (membranous to hyaline); 3 nerved; entire, or incised; *awnless, or mucronate (rarely)*. *Palea* present; relatively long to conspicuous but relatively short. *Lodicules* 2; fleshy; glabrous. *Stamens* 3. *Ovary* glabrous. *Fruit* small; ellipsoid; hilum short; pericarp fused; embryo large.



Fig. 31. *Brachyachne patentiflora*

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR sheath outlines uneven, or even. PCR sheath extensions absent. PCR cell chloroplasts centrifugal/peripheral, or centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 10 species. Africa, Australia. Helophytic to mesophytic; in open habitats (seasonal swamps and moist rock crevices); glycophytic. Botswana. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

***Brachyachne patentiflora* (Stent & Rattray) C.E. Hubb.**

Fig. 31. Pl. 25.

Perennial; tufted; 100–500 mm tall. Leaf blades 30–120 mm long; about 1 mm wide. Spikelets 3.0–4.4 mm long. Old leaf bases persistent and breaking into fibres; spikes slender, solitary, or sometimes paired; glumes not strongly keeled.



Flowering December to January. Seasonal swamps on waterlogged clayey soil and moist crevices on rocky outcrops. Infrequent. Biome: Savanna. Central tropical Africa. Similar in habit to *Microchloa caffra*, which has a solitary spike and strongly keeled glumes.

Description: Chippindall & Crook 1976 (237), Clayton et al. 1970–1982 (311). Voucher: Smith 4081. PRECIS code 9902970–00200.

***Brachychloa* S.M. Phillips**

Annual, or perennial; long-stoloniferous. Culms to 500 mm high (usually less); herbaceous; branched above (sometimes), or unbranched above (usually). Leaf blades linear to lanceolate; flat. *Ligule* a fringed membrane.

Inflorescence of spike-like main branches; open (with the branches appressed in *B. schiemaniana* and spreading in *B. fragilis*); *non-digitate*; espatheate. Spikelet-bearing axes disarticulating, or persistent; when disarticulating falling entire.

Spikelets solitary; biseriate; with short-pedicellate pedicellate spikelets; 3.5–7 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. *Glumes* two; more or less equal; markedly shorter than the spikelets; *decidedly shorter than the adjacent lemmas*; awnless; similar. Incomplete florets distal to the female-fertile florets, awnless; proximal incomplete florets absent.

Female-fertile florets 3–7. Lemmas similar in texture to the glumes (membranous); without a germination flap; 3–7 nerved (5 to 7 nerved in *B. schiemaniana*); incised; very shortly mucronate (from between the lobes). *Palea* present; relatively long. *Lodicules* 2; fleshy (?); glabrous. *Stamens* 3. *Ovary* glabrous. *Fruit* small (0.8 mm long); hilum short; pericarp free.

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR sheath outlines uneven and even. PCR sheath extensions present. Maximum number of extension cells 1. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 2 species. Southern Mozambique, Natal. Mesophytic to xerophytic; in shade and in open habitats; glycophytic (in coastal forests on sandy soil). Natal. 2 indigenous species.

References. 1. Phillips. 1982. Kew Bull. 37:133.

Species treatment by M. Koekemoer.

- 1(0). Plants annual; inflorescence with long and deciduous spikes; lemmas 3-nerved **B. fragilis**
 Plants perennial; inflorescence with short, persistent spikes (often in a loose head); lemmas 5–7-nerved **B. schiemaniana**

Brachychloa fragilis S.M. Phillips

Annual; tufted (culms decumbent); 250–500 mm tall. Leaf blades 50–100 mm long; 2–6 mm wide. Spikelets 4–5 mm long. Spikes in inflorescence longer than 30 mm, deciduous; lemma 3-nerved.

Sandy soil on coastal dunes. Rare. Biome: Savanna. Mozambique (Maputo). Only three known specimens, none at PRE. The holotype, Pooley 1650, was collected at Ulukondo in Natal and is now housed at Kew.

Description: Phillips 1982 (145 & 159). PRECIS code 9902864–00100.



Brachychloa schiemaniana (Schweick.) S.M. Phillips
 Fig. 32. Pl. 26.

(= *Heterocarpha schiemaniana* Schweick.) 1.

Perennial; stoloniferous; 150–300 mm tall. Leaf blades 40–80 mm long; 5–8 mm wide. Spikelets 4–7 mm long. Spikes in inflorescence 15–40 mm long, persistent; spikelets 6–8(–10)-flowered; lemma 5–7-nerved.

Flowering February to May. Sandy soil, dunes and forest margins. Rare and conservation status not known. Biome: Savanna. Mozambique.

Description: Phillips 1982 (145). Voucher: Schweikerdt 1908. PRECIS code 9902864–00200.



Brachypodium P. Beauv.

Brevipodium A. & D. Löve, *Trachynia* Link, *Tragus* Panzer.

Annual, or perennial; long-rhizomatous to caespitose. Culms 20–2000 mm high; herbaceous; unbranched above. Leaf blades linear; flat, or rolled (convolute). *Ligule an unfripped membrane.*

Inflorescence a single raceme, or paniculate (rarely); open; spatheate. Spikelet-bearing axes persistent.

Spikelets solitary; distichous; 13–40 mm long; compressed laterally; disarticulating above the glumes. Glumes two; very unequal, or more or less equal; markedly shorter than the spikelets; awned, or awnless; similar (lanceolate). Lower glume 5–7 nerved. Incomplete florets distal to the female-fertile florets, merely underdeveloped, awned, or awnless; proximal incomplete florets absent.

Female-fertile florets 8–22. Lemmas similar in texture to the glumes; 7 nerved; entire; awned. Awns 1; median; apical; non-geniculate; much shorter than the body of the lemma to about as long as the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; ciliate. Stamens 3. Ovary hairy. Fruit medium sized; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 5, 7, 9$, and 10 . Pooideae; Triticoideae; Brachypodieae. 16 species. Temperate, and tropical mountains. Mesophytic; in shade and in open habitats. Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. Indigenous species (2), naturalized species (1).

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1970. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Lemma awns 10–25 mm long; plants annual
 **B. distachyon**
 Lemma awns 4–8 mm long; plants perennial 2
 2(1). Culms erect, racemes straight, with 1–4 spikelets crowded near the apex; leaves mainly basal, rigid, erect, lanceolate; a mountain grassland species
 **B. bolusii**
 Culms straggling, racemes usually flexuous, with (3–)5–9 spikelets along the rachis; leaves mostly cauline, soft, spreading, linear; a forest species that occasionally extends to thickets and bushland
 **B. flexum**



Fig. 32. *Brachychloa schiemaniana*

***Brachypodium bolusii* Stapf**

Perennial; densely tufted; 150–450(–700) mm tall. Leaf blades 20–70(–170) mm long; to 4 mm wide. Spikelets to 30 mm long. Leaves basal, rigid, erect, lanceolate; racemes to 55 mm long, straight, with 1–4 spikelets crowded near the apex; lemma awns 4–8 mm long.



Flowering November to March. In mountain grassland. Locally common. Biome: Savanna and Grassland. Endemic. Very similar to *B. flexum*, which usually has straggling culms, flexuous racemes, spikelets (3–)5–9 and leaves cauline. Intermediates between these two species are common and very difficult to place.

Description: Stapf 1898–1900 (737), Chippindall 1955 (68). Illustration: Chippindall 1955 (fig. 40). Voucher: Edwards 646. PRECIS code 9904320–00100.

***Brachypodium distachyon* (L.) Beauv.**

Slender to fairly robust annual; tufted (culms often decumbent and branching near the base); 100–500(–700) mm tall. Leaf blades 20–90 mm long; to 5 mm wide. Spikelets 10–35(–40) mm long. Leaves mostly cauline, rigid or soft, young leaves erect, old leaves curly; racemes (10–)30–90(–100) mm long, with 2–6 spikelets; lemma awn 10–25 mm long.



Flowering sporadically throughout the year, but mainly September to January. In disturbed places such as gardens, excavations, roadsides and waste places, occasionally in native vegetation. Locally common. Naturalized from the Mediterranean. Biome: Fynbos and Succulent Karoo. Europe and the Mediterranean. Weed.

Description: Smith 1980 Fl. Europ. (5:189), Stapf 1898–1900 (735), Hitchcock & Chase 1950 (57), Chippindall 1955 (68). Voucher: Smook 3711. PRECIS code 9904320–00200.

***Brachypodium flexum* Nees**

Perennial; culms straggling, slender, wiry, sometimes decumbent and rooting at the lower nodes; 300–900 mm tall. Leaf blades 50–170 mm long; 2–8 mm wide. Spikelets 12–44 mm long. Leaves mainly cauline, linear; racemes 60–120 mm long, usually flexuous, with (3–)5–9 spikelets spread along the rachis; lemma awn 4–8 mm long.



Flowering October to April. In moist shady places of forests, usually near streams, occasionally in thickets and bushland. Locally common. Biome: Fynbos, Savanna, and Grassland. Endemic. Very similar to *B. bolusii*, which has leaves tufted at the base, culms erect and racemes straight with 1–4 spikelets.

Description: Clayton 1972 FTTA (371), Stapf 1898–1900 (736), Chippindall 1955 (68), Clayton et al. 1970–1982 (71). Illustration: Chippindall 1955 (fig. 39), Clayton et al. 1970–1982 (fig. 24). Voucher: Davidse 6787. PRECIS code 9904320–00300.



Fig. 33. *Brachypodium flexum*

Fig. 33. Pl. 27.

Briza L.

Chascolytrum Desv., *Chondrachyrum* Nees, *Tremularia* Fabric.

Annual, or perennial; long-rhizomatous, or caespitose. Culms 50–1000 mm high; herbaceous; *unbranched above*. Leaf blades linear to linear-lanceolate; flat. *Ligule an unfriended membrane*.

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets 2.5–25 mm long; compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; markedly shorter than the spikelets; awnless; similar (broad & cordate; thin & papery). Incomplete florets distal to the female-fertile florets, merely underdeveloped, awnless; proximal incomplete florets absent.

Female-fertile florets 4–20. *Lemmas* similar in texture to the glumes; 7–15 nerved; *as broad as long, gibbous and umbonate, cordate at base*; entire, or incised (obtusely, cuspidate, bidentate or mucronate); awnless, or mucronate (the mucro less than 1.5 mm). Palea present; conspicuous but relatively short. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short, or long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 5$ and 7. Pooideae; Poodae; Poaceae. 16 species. North temperate, South America. Mesophytic; mostly in open habitats (dry to moist soils). Transvaal, Natal, Orange Free State and Cape Province. 3 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Launert. 1971. FZ. 3. Matthei. 1975. Willdenowia 8: 79. 4. Clayton & Renvoize. 1986. Gen. Gram. 5. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.



Fig. 34. *Briza minor*

- 1(0). Plants perennial; lemmas acuminate ***B. subaristatum***
Plants annual; lemmas obtuse to obscurely acuminate 2
2(1). Panicle appearing secund, with 3–12 nodding spikelets; spikelets longer than wide, 8–25 mm long, 8–15 mm wide ***B. maxima***
Panicle open, with more than 20 spikelets; spikelets as wide as, or slightly wider than long, 3–5 mm long, 3–6 mm wide ***B. minor***

Briza maxima L.

Big quaking grass, groot-bewertjiegras.



Pl. 28.

Annual; loosely tufted (culms erect, simple or branched); 100–600(–1000) mm tall. Leaf blades 70–250 mm long; 3–8 mm wide. Spikelets 8–25 mm long; 8–15 mm wide. Panicle open, branches single or in fascicles of 2–4; spikelets 3–12, longer than wide, 7–20-flowered, nodding, solitary at the tips of slender branches; glumes green, brown or purple, 5–9-nerved; lemmas straw-coloured, sometimes variegated with purple.

Flowering July to December. Mostly on well-drained soils in disturbed areas, especially on roadsides or on the margins of irrigated lands, cultivated in gardens. Locally common. Naturalized from the Mediterranean region. Biome: Fynbos, Savanna, and Grassland. Mediterranean region, naturalized in many warm temperate countries. Domestic use (for dried flower arrangements), or ornamental (in gardens), or weed (roadsides).

Description: Chippindall & Crook 1976 (202), Linder (43), Stapf 1898–1900 (708), Hitchcock & Chase 1950 (137), Chippindall 1955 (49), Clayton et al. 1970–1982 (53). Illustration: Chippindall 1955 (fig. 16), Clayton et al. 1970–1982 (fig. 19). Voucher: Loxton 205. PRECIS code 9904040–00100.

Briza minor L.

Little quaking grass, klein-bewertjiegras.



Fig. 34.

Annual; loosely tufted (culms soft with dark nodes, often branched near base); 100–600 (–700) mm tall. Leaf blades 40–220 mm long; 3–9 mm wide. Spikelets 3–5 mm long; 3–6 mm wide. Panicle open, spreading, branches single or in fascicles of 2–4; spikelets numerous, almost as wide as or slightly wider than long, 3–8-flowered; glumes 3–5-nerved; glumes and lemmas green or tinged with purple, margins distinctly lighter in colour.

Flowering September to December. Usually found in moist shady and disturbed places around streams and vleis on loam or clayey soils. Infrequent to locally common. Naturalized from the Mediterranean region. Biome: Fynbos, Savanna, and Grassland. Mediterranean region, naturalized in many warm temperate countries. Ornamental (in gardens and in dried flower arrangements), or weed (roadsides).

Description: Chippindall & Crook 1976 (203), Linder (42), Stapf 1898–1900 (709), Hitchcock & Chase 1950 (137), Chippindall 1955 (49), Clayton et al. 1970–1982 (53). Illustration: Chippindall 1955 (fig. 17), Hitchcock & Chase 1950 (fig. 266). Voucher: Smook 3686. PRECIS code 9904040–00200.

Briza subaristatum Lam.

Pl. 29.

(=*B. triloba* Nees) 1;
(=*Chascolytrum subaristatum*
(Lam.) Desv.) 4.

Perennial; tufted; 300–600 mm tall. Leaf blades 80–200 mm long, rolled; 1–2 mm wide. Spikelets 4–5 mm long; 2.0–3.5 mm wide. Basal sheaths persisting as fibres; panicle contracted; spikelets ovoid, 6–10-flowered; glumes mucronate, 5–7-nerved, cordate at the base.

Flowering October to December. In moist cultivated areas and on roadsides. Rare. Naturalized from South America. Biome: Fynbos. South and Central America.

Description: Chippindall 1955 (47). Voucher: Liebenberg 4221. PRECIS code 9904040–00300.



Bromus L.

Aechmophra Steud., *Anisantha* Koch, *Avenaria* Fabrich., *Bromopsis* (Dumort.) Fourr., *Ceratochloa* P. Beauv., *Forasaccus* Bub., *Genea* (Dumort.) Dumort., *Libertia* Lejeune, *Michelaria* Dumort., *Nevskiella* Krecz & Vved., *Serrafalcus* Parl., *Stenofestuca* (Honda) Nakai, *Triniusa* Steud., *Trisetobromus* Nevski.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 30–1900 mm high; herbaceous; unbranched above. Sheath margins joined. Leaf blades linear; usually flat, or rolled (somewhat involute, or convolute). Ligule an unfringed membrane.

Inflorescence a single raceme (rarely), or paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets (5–)10–70 mm long; compressed laterally; disarticulating above the glumes. Glumes two; very unequal (usually), or more or less equal (rarely); decidedly shorter than the adjacent lemmas; awnless; similar (persistent). Incomplete florets distal to the female-fertile florets, merely underdeveloped, usually awned, or awnless; proximal incomplete florets absent.

Female-fertile florets 3–30 (rarely 1–2). Lemmas similar in texture to the glumes; 5–15 nerved; incised (usually), or entire; awnless, or mucronate, or awned. Awns when present 1; median; from the sinus, or dorsal; non-geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; relatively long to conspicuous but relatively short. Lodicules 2; fleshy, or membranous; glabrous. Stamens 1–3. Ovary hairy; with a conspicuous apical appendage (the styles lateral). Fruit medium sized; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Triticodae; Bromeae. About 150 species. North temperate, tropical mountains, South America. Mesophytic, or xerophytic; in shade and in open habitats. Namibia, Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. Indigenous species (6), naturalized species (9).

Supposed intergeneric hybrid with *Festuca*: *X Bromofestuca* Prodan.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1970. FTEA. 3. Pinto-Escobar. 1976. Caldasia 11: 9–16. 4. Linder. 1986. Bothalia 16: 61. 5. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.



Fig. 35. *Bromus catharticus*

- 1(0). Lemma awns stiff and straight, 30–70 mm long . . . 2
- Lemma awns fine, straight or spreading, 0.2–25.0 mm long 3
- 2(1). Callus of lemma rounded; spikelets usually open, showing the rachis between the lemmas; panicle usually lax and spreading **B. diandrus**
- Callus of lemma pointed; spikelets usually tight, very rarely showing the rachis; panicle usually dense and erect **B. rigidus**

- 3(1). Plants perennial; anthers 2–8 mm long 4
Plants annual (or short-lived perennial in *B. catharticus*); anthers 0.5–1.5 mm long 8
- 4(3). Old leaf sheaths flimsy, curly, not fibrous; lemma awns 0.5–5.0 mm long 5
Old leaf sheaths firm, erect, fibrous; lemma awns 3–15 mm long 6
- 5(4). Lemma awns shorter than 2 mm; plants rhizomatous *B. inermis*
Lemma awns longer than 3 mm; plants tufted *B. leptoclados*
- 6(4). Lemmas glabrous; spikelets (including awns) 35–55 mm long *B. natalensis*
Lemmas villous; spikelets (including awns) 20–45 mm long 7
- 7(6). Pedicels glabrous or sparsely hairy, shorter than the spikelets *B. speciosus*
Pedicels villous, longer than the spikelets *B. firmior*
- 8(3). Upper glume 3-nerved; lower glume 1-nerved ... 9
Upper glume 5–9-nerved; lower glume 3–9-nerved (occasionally 1-nerved in *B. pectinatus*) 11
- 9(8). Culms hairy below the inflorescence ... *B. rubens*
Culms glabrous below the inflorescence 10
- 10(9). Panicles with spikelets more or less secund; lower pedicels with about four spikelets; upper glume 7–12 mm long; lemmas 8–13 mm long *B. tectorum*
Panicles with spikelets not secund; lower pedicels with one or two spikelets; upper glume 14–20 mm long; lemmas 12–15 mm long *B. madritensis*
- 11(8). Glumes and lemmas sharply keeled, tips minutely bifid or acute, occasionally extending into an awn shorter than 3 mm; spikelets compressed *B. catharticus*
Glumes and lemmas rounded on the back, tips distinctly bifid, awns 3–18 mm long, from the sinus between the lobes; spikelets more or less terete 12
- 12(11). Panicle open with at least some of the pedicels longer than the spikelets 13
Panicle contracted, with all the pedicels shorter than the spikelets 14
- 13(12). Awns equalling or shorter than the lemmas; lemma tips rounded to subacute ... *B. commutatus*
Awns longer than the lemmas; lemma tips acute to subacuminate *B. pectinatus*
- 14(12). Spikelets 18–25 mm long; awns flattened, twisted and spreading *B. alopecurus*
Spikelets 7–15 mm long; awns not flattened, occasionally twisted and spreading 15
- 15(14). Spikelets densely villous; awns somewhat spreading and twisting; plants growing in small cushions, to 200 mm tall *B. hordeaceus* subsp. *ferronii*
Spikelets villous to scabrid; awns straight and erect; plants growing in erect tussocks, to 600 mm tall *B. hordeaceus* subsp. *molliformis*

Bromus alopecurus Poir.

Annual; tufted; 150–300 mm tall. Leaf blades 30–70 mm long; 1–3 mm wide. Spikelets 18–23 mm long; 2–3 mm wide. Panicle contracted, pedicels absent or shorter than the spikelets; lower glume 5-nerved; lemmas 9–12 mm long, awns 8–15 mm long, flattened, twisted and patent.

Flowering October. Roadsides and waste ground. Rare. Naturalized from the Mediterranean. Biome: Fynbos. Central and eastern Mediterranean basin; western Asia. Known from a single collection at Caledon, Du Toit 1823,



which is in the Stellenbosch herbarium.

Description: Bor 1985 (1808), Smith 1980 Fl. Europ. (5:188). PRECIS code 9904280–00025.

Bromus catharticus Vahl

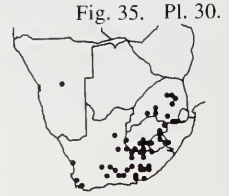
(=*B. unioides* H.B.K.) 3;
(=*B. willdenowii* Kunth) 3.

Reddingsgras, rescue grass.

Short-lived perennial, or annual; tufted; 150–1000 mm tall. Leaf blades 5–8 mm wide. Spikelets 20–35 mm long; 5–8 mm wide. Panicle lax, pedicels longer than the spikelets; spikelets compressed; glumes and lemmas prominently keeled, acute; glumes 3–9-nerved; lemmas 15–25 mm long, minutely bifid, lobes shorter than 0.5 mm, awns shorter than 3 mm.

Flowering October to April. Usually in moist to wet places, often in the shade, in disturbed and natural veld. Common. Naturalized, different strains from Europe, Australia and America. Biome: Fynbos, Grassland, and Nama-Karoo. Worldwide. Very good annual winter pasture, or erosion control, or weed (in disturbed and moist places). The great variability in this species can be attributed to the large range of habitats and growth conditions in which it appears.

Description: Chippindall & Crook 1976 (213), Stapf 1898–1900 (734), Chippindall 1955 (63), Clayton et al. 1970–1982 (67). Illustration: Chippindall 1955 (fig. 35). Voucher: Smook 3879. PRECIS code 9904280–00050.



Bromus commutatus Schrad.

Hairy chess.

Annual; tufted; 150–900 mm tall. Leaf blades 60–150 mm long; 3–6 mm wide. Spikelets 10–25 mm long; 4–7 mm wide. Panicle lax, pedicels (at least some of them) longer than the spikelets; spikelets almost linear at maturity; lower glume 3–5-nerved, upper 5–9-nerved; lemmas 7–9 mm long, awns 3–8 mm long.

Flowering September to December. In disturbed, wet places. Infrequent. Biome: Fynbos, Grassland and Succulent Karoo. Endemic. Pasture.

Description: Stapf 1898–1900 (728), Chippindall 1955 (66). Voucher: Theron 341. PRECIS code 9904280–00100.



Bromus diandrus Roth

Langnaaldbromus, predikant-luis, riggut brome.

Annual; loosely tufted; 300–1100 mm tall. Leaf blades 50–400 mm long; 3–8 mm wide. Spikelets 30–90 mm long (including awns); 3–8 mm wide. Panicle usually lax and spreading, pedicels glabrous, scabrid or villous; spikelets open, wedge-shaped; lower glume 1-nerved, upper 3-nerved; lemmas 12–22 mm long, awns stiff and straight, 30–70 mm long.

Flowering September to January (occasionally in March). In disturbed and weedy places. Locally common. Naturalized from Europe. Biome: Fynbos and Nama-Karoo. Mediterranean region eastwards to central Asia. Introduced to temperate countries. Serious weed (of cultivated and disturbed areas, especially in the winter rainfall areas of the Cape). Two distinct species, *B. diandrus* and *B. rigidus*, are



recognized in Europe. In South Africa these species hybridize to form a complete range of intermediates which can be named *B. diandrus* agg.

Description: Bor 1985 (1800), Chippindall & Crook 1976 (214), Smith 1980 Fl. Europ. (5:183), Chippindall 1955 (67), Clayton et al. 1970–1982 (67). Illustration: Chippindall 1955 (fig. 38). Voucher: Von Breitenbach 43. PRECIS code 9904280–00200.

Bromus firmior (Nees) Stapf

(=*B. firmior* (Nees) Stapf var. *firmior* 5; (= *B. firmior* (Nees) Stapf var. *leiorhachis* Stapf) 5.

Perennial; tufted; 500–1500 mm tall. Leaf blades 200–400 mm long; 4–8 mm wide. Spikelets 15–45 mm long; 4–8 mm wide. Panicle open, much exserted, pedicels sparsely to densely pilose, longer than the spikelets; spikelets green to purple; lower glume 1–3-nerved, upper 3–5-nerved; lemmas villous, 10–20 mm long, awns 3–12 mm long.

Flowering November to March. At high altitudes on moist grassy slopes of the Drakensberg. Locally common. Biome: Grassland. Endemic. Very closely related to *B. natalensis* which has glabrous spikelets and to *B. speciosus*, which has glabrous pedicels.

Description: Stapf 1898–1900 (733), Chippindall 1955 (64). Voucher: Killick 1629. PRECIS code 9904280–00350.

Bromus hordeaceus L. subsp. *ferronii* (Mabille) P.M. Sm.

Annual; tufted (culms decumbent-erect); to 200 mm tall. Leaf blades 50–150 mm long; 3–4 mm wide. Spikelets 7–15 mm long; 3–5 mm wide. The densely villous spikelets, spreading and twisted awns and plant height distinguish this subsp. from subsp. *molliformis*.

Weedy places. Rare. Naturalized from France and Britain. Biome: Savanna. Europe. Known from a single collection, Paterson 2284, housed at BOL.

Description: Smith 1980 Fl. Europ. (5:187). PRECIS code 9904280–00420.

Bromus hordeaceus L. subsp. *molliformis* (J. Lloyd) Maire & Weiller

(=*B. molliformis* Lloyd) 5.

Soft brome.

Annual; tufted; to 600 mm tall. Panicle contracted, often elliptical, pedicels pilose to villous, shorter than the spikelets; spikelets densely villous; lower glume 3–5-nerved, upper 7-nerved; lemmas 6–9 mm long, awns 3–7 mm long, scabrid, erect or somewhat spreading.

Flowering October to February. Cultivated lands and other disturbed areas. Locally common. Naturalized from Europe. Biome: Fynbos, Grassland, and Nama-Karoo. Europe. Weed (of cultivation).

Description: Smith 1980 Fl. Europ. (5:187), Stapf 1898–1900 (91), Chippindall 1955 (66). Voucher: Crook 2345. PRECIS code 9904280–00430.

Bromus inermis Leyss.

Smooth brome.

Perennial; rhizomatous; 500–1000 mm tall. Leaf blades 200–500 mm long; 4–7 mm wide. Spikelets 10–20 mm long. Panicle open, pedicels glabrous to scabrid; spikelets narrowly oblong; lower glume 1-nerved, upper 3-nerved; lemmas 6.0–8.5 mm long, awns fine, to 1 mm long.

Flowering November to April. Disturbed or weedy places. Rare. Naturalized from Europe. Biome: Savanna. Europe. Planted for cultivated pasture. A very variable species.

Description: Smith 1980 Fl. Europ. (5:184), Chippindall 1955 (65). Voucher: Galpin 7944. PRECIS code 9904280–00500.

Bromus leptoclados Nees

Mountain brome grass.

Perennial; tufted; (200–)500–1500 mm tall. Leaf blades 100–300 mm long; 5–13 mm wide. Spikelets 10–30 mm long; 2–6 mm wide. Panicle open, pedicels scabrid; spikelets open or with florets closely arranged; lower glume 1–3-nerved, upper 3–5-nerved; lemmas 8–12 mm long, awns up to 5 mm long.

Flowering October to February. Usually in moist, shady places along rivers and streams. Locally common. Biome: Fynbos, Grassland, and Nama-Karoo. Montane areas of tropical Africa. Palatable natural pasture.

Description: Chippindall & Crook 1976 (215), Stapf 1898–1900 (731), Chippindall 1955 (65), Clayton et al. 1970–1982 (68). Illustration: Clayton et al. 1970–1982 (fig. 23). Voucher: Acocks 18671. PRECIS code 9904280–00850.

Bromus madritensis L.

Spanish brome.

Slender annual; tufted; 120–350(–600) mm tall. Leaf blades 80–200 mm long; 2–5 mm wide. Spikelets 10–25 mm long; 4–5 mm wide. Panicle dense or somewhat lax, lower pedicels with 1–2 spikelets, pedicels shorter than the spikelets; lower glume 1-nerved, upper 3-nerved; lemmas 12–15 mm long, awns erect to recurved, 15–20 mm long.

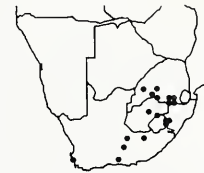
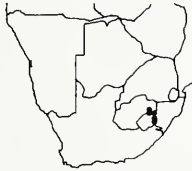
Flowering October. Weedy places. Rare. Biome: Fynbos. Mediterranean region eastwards to Afghanistan. Naturalized worldwide.

Description: Bor 1985 (1805). Voucher: Parker 4917. PRECIS code 9904280–01000.

Bromus natalensis Stapf

(=*B. natalensis* Stapf var. *lasiophilus* Stapf) 5; (= *B. speciosus* sensu Compton, non Nees) 5.

Perennial; rhizomatous; 500–1200 mm tall. Leaf blades 70–150 mm long; 4–7 mm wide. Spikelets 35–55 mm long; 5–10



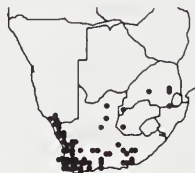
mm wide. Panicle open, pedicels sparsely villous to echinate; spikelets glabrous or finely scabrid; lower glume 3-nerved, upper 5–7-nerved; lemmas 15–18 mm long, awns 6–15 mm long.

Flowering October to January. Rocky hillsides. Infrequent. Biome: Grassland. Endemic.

Description: Stapf 1898–1900 (732), Chippindall 1955 (64). Illustration: Chippindall 1955 (fig. 36). Voucher: Codd 8142. PRECIS code 9904280–01000.

***Bromus pectinatus* Thunb.**

(=*B. japonicus* sensu Chippind., non Thunb. var. *japonicus*) 5; (= *B. japonicus* sensu Chippind., non Thunb. var. *velutinus* (Nocc.) Aschers. & Graebn.) 5.



Annual; tufted; 100–800 mm tall. Leaf blades 50–300 mm long; 2–8 mm wide. Spikelets 10–30 mm long; 3–6 mm wide. Panicle open, pedicels longer than the spikelets; spikelets laterally compressed; lower glume 1–3-nerved, upper 5–7-nerved; lemmas 7–14 mm long, tips acute to subacuminate, awns 6–18 mm long.

Flowering August to February. In disturbed and eroded areas. Locally common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Temperate and montane regions of Africa and the Middle East.

Description: Chippindall 1955 (68). Voucher: Repton 2633. PRECIS code 9904280–01115.

***Bromus rigidus* Roth**

Ripgut brome.



Annual; loosely tufted; 400–700 mm tall. Leaf blades 50–150 mm long; 3–7 mm wide. Spikelets 15–25 mm long; 2–6 mm wide. Panicle contracted, pedicels hispid to villous; spikelets narrow, ovate to linear; lower glume 1-nerved, upper 3-nerved; lemmas 20–25 mm long, awns 30–50 mm long.

Flowering September to October. Disturbed and weedy places. Infrequent. Naturalized from the Mediterranean basin. Biome: Fynbos. Northern America and the Mediterranean region. Weed. Distinct in Europe, but forms a complete range of intermediates with *B. diandrus* in South Africa. These intermediates are best identified as *B. diandrus* agg.

Description: Bor 1985 (1802), Smith 1980 Fl. Europ. (5:183), Hitchcock & Chase 1950 (53). Illustration: Hitchcock & Chase 1950 (fig. 47). Voucher: Cleghorn 3106. PRECIS code 9904280–01125.

***Bromus rubens* L.**

Red brome, foxtail chess.



Annual; tufted; 150–450 mm tall. Leaf blades 60–120 mm long; 3–5 mm wide. Spikelets 21–28 mm long. Culms hairy below the inflorescence; panicle erect, compact and ovoid, lower branches fascicled; spikelets somewhat wedge-shaped, often reddish; lower glume 1-nerved, upper 3-nerved; lemmas 13–15 mm long, awns 18–22 mm long.

Disturbed places and waste ground. Rare. Naturalized

from Europe. Biome: Desert. Mediterranean region eastwards to central Asia, introduced to North America. Known from a single collection at Oranjemund. Specimen at BOL.

Description: Bor 1985 (1807), Hitchcock & Chase 1950 (54). Illustration: Hitchcock & Chase 1950 (fig. 51). PRECIS code 9904280–01150.

***Bromus speciosus* Nees**

Purple brome.



Perennial; tufted; 300–600 mm tall. Leaf blades 80–200 mm long; 2–4 mm wide. Spikelets 15–50 mm long; 3–6 mm wide. Panicle open, pedicels glabrous or sparsely scabrid, almost as long as the spikelets; spikelets linear, purplish; lower glume 1–3-nerved, upper 3–5-nerved; lemmas 10–15 mm long, awns 3–6 mm long.

Flowering December to March. On steep, moist mountain slopes, occasionally in the shade and along streams. Infrequent. Biome: Grassland. Endemic. Very closely related to *B. firmior*, which has pedicels villous, and to *B. natalensis*, which has lemmas 35–55 mm long and glabrous.

Description: Stapf 1898–1900 (733), Chippindall 1955 (64). Voucher: Dyer 253. PRECIS code 9904280–01200.

***Bromus tectorum* L.**

Annual; tufted; 100–250 mm tall. Leaf blades 60–100 mm long; 2–4 mm wide. Spikelets 8–15 mm long; 2–4 mm wide. Culms glabrous below the inflorescence; panicle with spikelets more or less secund, lower pedicels with about four spikelets; lower glume 1-nerved, upper 3-nerved; lemmas 8–13 mm long, awns 8–20 mm long.



Flowering August to October. Sandy soil on roadsides. Rare. Naturalized from the Mediterranean. Biome: Succulent Karoo. Mediterranean region.

Description: Bor 1985 (1811). Voucher: Rosch & Le Roux 634. PRECIS code 9904280–01300.

***Calamagrostis* Adans.**

Achaeta Fourn., *Amagris* Raf., *Ancistrochloa* Honda, *Anisachne* Keng, *Athernotus* Dulac, *Aulacolepis* Hack., *Chamaecalamus* Meyen, *Cinnagrostis* Griseb., *Neaulacolepis* Rauschert, *Pteropodium* Steud., *Sclerodeuxia* Pilger.

Perennial (some species reedlike); long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 100–2000 mm high; herbaceous; unbranched above. Leaf blades linear; flat (usually), or rolled (convolute). Ligule an unfripped membrane (sometimes erose-ciliate).

Inflorescence paniculate; open, or contracted; espathate. Spikelet-bearing axes persistent.

Spikelets 3–7(–8) mm long; compressed laterally; disarticulating above the glumes. Hairy callus present (the hairs more than 0.5 mm long, often about as long as, and surrounding, the lemma). Glumes two; more or less equal; much exceeding the spikelets; awnless; similar. All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); 3–5 nerved; incised; awned. Awns 1; median; from the sinus, or dorsal; non-geniculate, or geniculate; much shorter than the body of the lemma to much longer than the body of the lemma. Paiea present; relatively



Fig. 36. *Calamagrostis epigeios* var. *capensis*

long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. About 230 species. Temperate. Mostly helophytic to mesophytic; in shade or in open habitats; glycophytic, or maritime-arenicolous to halophytic (rarely — but *C. epigeios* \times *Ammophila arenaria* (\times *Ammocalamagrostis*) is a valuable sand binder). Transvaal and Cape Province. 1 indigenous species.

Intergeneric hybrids with *Agrostis*. *C. epigeios* hybridizes with *Ammophila arenaria* (\times *Ammocalamagrostis* P. Fourn., a useful sand stabilizer. See also \times *Calamophila* O. Schwartz).

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1970. FTEA.

Species treatment by G.E. Gibbs Russell.

Calamagrostis epigeios (L.) Roth var. *capensis* Stapf

Fig. 36. Pl. 31.

Erect perennial; tufted and rhizomatous (rhizome creeping); 600–1200 mm tall. Leaf blades to 450 mm long; to 10 mm wide. Spikelets 5.5–8.0 mm long. Panicle narrow, to 250 mm long, light brown; florets with conspicuous long white callus hairs.



Flowering January to May.

Vleis. Rare (not collected in the eastern Cape mountains since 1954). To east Africa. Possibly introduced from the Cape mountains to the Transvaal. The typical variety occurs in temperate Europe and Asia and has smaller spikelets.

Description: Stapf 1898–1900 (551), Chippindall 1955 (94), Clayton et al. 1970–1982 (103). Illustration: Chippindall 1955 (fig. 66), Clayton et al. 1970–1982 (fig. 35). Voucher: Codd 2733. PRECIS code 9902460–00100.

Catalepis Stapf & Stent

Perennial; caespitose. Culms 50–400 mm high; herbaceous; unbranched above. Leaf blades linear; to 1 mm wide; folded, or rolled (rarely flat). Ligule a fringe of hairs.

Inflorescence of spike-like main branches, or paniculate; contracted (very much so: the lateral branches short, sometimes reduced to 4 or 5 spikelets); non-digitate; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; not secund; 4–5 mm long; compressed laterally; falling with the glumes (seeming to disarticulate at base of pedicel). Glumes two; relatively large (i.e., the upper glumes); very unequal; much exceeding the spikelets (i.e. the upper); awnless; very dissimilar (the lower reduced to a small subulate scale, the upper lanceolate). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1 (lanceolate). Lemmas similar in texture to the glumes (thin); without a germination flap; 3 nerved; entire; awnless. Palea present (broad); relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous.

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR sheath outlines uneven. PCR sheath extensions present. Maximum number of extension cells 1. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 1 species. South Africa. Mesophytic (locally abundant in mountain grassland); in open habitats. Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.



Fig. 37.
Catalepis gracilis

***Catalepis gracilis* Stapf & Stent**

Gause grass.

Creeping perennial; rhizomatous and tufted; 100–400 mm tall. Leaf blades 10–150 mm long; 1–2 mm wide. Spikelets 4–5 mm long. Leaves fine and curly with age; panicle spike-like, 15–30 mm long; lower glume reduced to a small scale; upper glume 1-nerved.

Flowering January to March. Sometimes in shallow sandy soil, but more often on black clay in vleis. Locally common. Biome: Grassland. Highly palatable natural pasture, or erosion control (pioneer), or weed (roadsides).

Description: Chippindall 1955 (207). Illustration: Chippindall 1955 (plate 4). Voucher: Schweickerdt 1760. PRECIS code 9902942–00100.



Fig. 37. Pl. 32.

Catapodium Link

Scleropoa Griseb., *Synaphe* Dulac. Sometimes included in *Desmazeria*.

Annual; caespitose (or culms solitary). Culms 100–500 mm high; herbaceous; unbranched above. Leaf blades linear; flat, or rolled (convolute when dry). *Ligule* an *unfringed membrane*.

Inflorescence a single raceme, or paniculate (rigid, spikelike); open, or contracted (the branches with small adaxial pulvini); espatheate. Spikelet-bearing axes persistent.

Spikelets secund (appressed to one side of the axis); 4–9 mm long; compressed laterally; disarticulating above the glumes. *Glumes* present; two; more or less equal; markedly shorter than the spikelets; awnless; *carinate*; lower lanceolate, upper ovate. Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 3–12. Lemmas similar in texture to the glumes; 5 nerved; entire; awnless. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae: Poodae: Poeae. 2 species. Europe, Mediterranean. Mesophytic to xerophytic (in dry microhabitats); in open habitats; maritime-arenicolous, or halophytic, or glycophytic. Cape Province. 1 naturalized species.

References. 1. Stace. 1980. Fl. Europ. 2. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.



Fig. 38. *Catapodium rigidum*

Catapodium rigidum (L.) C.E. Hubb.

(=*Desmazeria rigida* (L.) C.E. Hubb.) 1; (= *Scleropoa rigida* (L.) Griseb.) 1.

Fern grass.

Slender annual; tufted (culms erect or geniculate, fasciculate, rarely solitary); 100–250(–450) mm tall. Leaf blades 30–150 mm long; 1.0–2.0(–3.5) mm wide. Spikelets 5–7(–10) mm long. Panicle narrow, 50–100 mm long, branches stiff, alternate, simple, bearing 2–5 spikelets; spikelets 6–10-flowered, more or less second, borne on trigonous pedicels; glumes more or less equal, 1.8–2.2 mm long; florets widely spaced on the fragile rachilla, awnless.

Flowering October to December. Mostly on waste land in parks, gardens and disturbed places in moist shady areas, also in rock crevices amongst other Fynbos species. Infrequent to locally common. Naturalized from Mediterranean region. Atlantic islands, Europe and Mediterranean region eastwards to Iran. Naturalized in Australia, New Zealand, Tasmania and temperate north and south America. Common garden and roadside weed.

Description: Bor 1985 (1721), Chippindall & Crook 1976 (224), Linder (61), Stapf 1898–1900 (718), Hitchcock & Chase 1950 (77), Chippindall 1955 (50). Illustration: Chippindall 1955 (fig. 20), Hitchcock & Chase 1950 (fig. 108). Voucher: Hugo 1954. PRECIS code 9904200–00100.

Fig. 38. Pl. 33.



References. 1. Chippindall. 1955. Gr. & Past. 2. Delisle. 1963. Iowa St. Jour. Sci. 37: 259.

Species treatment by H.M. Anderson.

Cenchrus L.

Echinaria Fabric., *Nastus* Lunell, *Raram* Adans.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 50–1000(–1500) mm high; herbaceous; branched above. Leaf blades linear, or linear-lanceolate; flat, or folded. Ligule a fringed membrane to a fringe of hairs. The spikelets of sexually distinct forms on the same plant.

Inflorescence a false spike, with clusters of spikelets on reduced axes (spikelets in prickly glomerules (burs) composed of coalescing spines representing modified branchlets); espatheate. Spikelet-bearing axes disarticulating (but the main axis persistent); falling entire (i.e., the burs falling).

Spikelets with 'involucre' of 'bristles' (the bristles coalescing; contrast *Pennisetum*). The 'bristles' nearly always spiny, markedly coalescent basally (not spiny, merely ciliate, in *C. ciliaris*). Female-fertile spikelets compressed dorsiventrally; falling with the glumes (i.e., in the burs). Glumes present; two; very unequal; awnless; very dissimilar, or similar (hyaline or membranous). Proximal incomplete florets 1; paleate, or epaleate (rarely), palea fully developed, or reduced (rarely); male, or sterile.

Female-fertile florets 1. Lemmas similar in texture to the glumes, or decidedly firmer than the glumes (firmly membranous, dull, papery or coriaceous); smooth; not becoming indurated; hairless; having the margins lying flat and exposed on the palea; with a clear germination flap; 3–7 nerved; entire; awnless. Palea present; relatively long. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Photosynthetic pathway. C₄; NADP–ME (*pauciflorus*, *incertus*); XyMS–. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$ and 12. Panicoideae; Panicoideae; Paniceae. 22 species. Tropical and warm temperate. Mesophytic to xerophytic ('sand-burrs'); in shade, or in open habitats (grassland, bush and weedy places); maritime-arenicolous, or glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. Indigenous species (1), naturalized species (3).



Fig. 39. *Cenchrus ciliaris*

- 1(0). Perennial; bristles 5–10 mm long, joined only at the base, forming a small inconspicuous disc below the spikelet cluster **C. ciliaris**
Annual; bristles and/or spines 2–5 mm long, joined above the base to form a hard spiny involucre around the spikelet cluster 2
2(1). Involucre with two distinct clefts; spines all similar, flattened and spreading at base; no bristles **C. incertus**
Involucre without distinct clefts; spines in two whorls, inner spines connate, outer bristle-like 3
3(2). Involucre with a distinct ovate disc at base; inner spines with 1–3 shallow grooves **C. biflorus**
Involucre with an inconspicuous disc at base; none of the spines with grooves **C. brownii**

Cenchrus biflorus Roxb.

Annual; tufted; to 800 mm tall. Leaf blades 60–350 mm long; 4–10 mm wide. Spikelets 5 mm long; 4 mm wide. Inflorescence a false spike 20–100 mm long; spikelet involucre in two whorls, inner whorl with connate spines which are plumose on their inner surface and with 1–3



shallow grooves on their outer surface, outer whorl bristle-like and short, 40–60 spines; base of burr with a distinct ovoid disc.

Flowering February to June. Mainly sandy soil. Infrequent. Invader from tropical America. Biome: Savanna and Grassland. Pantropical weed.

Description: De Lisle 1963 (333). Illustration: De Lisle 1963 (fig. 21(1-L)). Voucher: De Winter 9194. PRECIS code 9901400–00100.

Cenchrus brownii Roem. & Schult.

Fine-bristled burgrass.

Annual; tufted; 300–900 mm tall. Leaf blades 80–150 mm long; 8–10 mm wide. Spikelets 4–6 mm long; 4–6 mm wide. Inflorescence a false spike, 30–100 mm long; spikelet involucre in two whorls, inner one with connate spines which are plumose on their inner surface, the outer one with spines which are bristle-like and short, 40–80 spines; burr with an inconspicuous disc at base.

Flowering January to June. Mainly sandy soil. Infrequent. Invader from tropical America. Biome: Savanna and Grassland. Pantropical weed.

Description: Chippindall 1955 (451). Illustration: Chippindall 1955 (375). Voucher: Smook 1906. PRECIS code 9901400–00200.

Cenchrus ciliaris L.

Buffelsgras.

Perennial; tufted; 600–1000 mm tall. Leaf blades 100–250 mm long; 4–8 mm wide. Spikelets 4–5 mm long; 3 mm wide. Inflorescence a bristly false spike, 40–120 mm long, straw or purple; bristles mostly 5–10 mm long, inner bristles slender and plumose, outer bristles slender and scabrid, all the bristles are joined at base below the spikelet cluster to form a small inconspicuous disc.

Flowering August to April. Common in hot dry areas, especially on sandy soils, widespread elsewhere. Common. Biome: Savanna, Grassland, and Nama-Karoo. Mainly Africa, India and other hot drier areas of the world. Pasture (cultivated). Variable species, with many cultivars available. May be confused with *Pennisetum foermerianum* which has an interrupted panicle, with bristles shorter and plumose and with *Enneapogon cenchroides*, which has 9-lobed lemmas with long awns and no bristles at the base of the spikelet.

Description: Farming in South Africa leaflet 114 1983 A cultivation guide, Chippindall 1955 (451). Illustration: Chippindall 1955 (fig. 374). Voucher: Smook 2822. PRECIS code 9901400–00300.

Cenchrus incertus M.A. Curtis

(=*C. pauciflorus* Benth.) 2.

Annual; tufted; 100–400 mm tall. Leaf blades 60–120 mm long; 3–4 mm wide. Spikelets 5–7 mm long; 3–4 mm wide. Inflorescence open or compact 20–80 mm long; burrs ovoid to globose with clefts on two sides, with 8–40 spines of variable shape and size, the inner spines are more regular with a plumose inner surface, while the outer spines are connate and spreading in all directions.

Flowering January to March. Mainly sandy soil. Infrequent. Invader from tropical America. Biome: Fynbos, Savanna, and Grassland. Pantropical weed.

Description: Chippindall 1955 (452). Illustration: Chippindall 1955 (fig. 375). Voucher: Fellingham 244. PRECIS code 9901400–00400.

Centropodia Reichenb.

Asthenatherum Nevski.

Annual, or perennial (with glaucous stems and leaves); caespitose to decumbent. Culms 30–1500 mm high; herbaceous; unbranched above (but often branched near the base). Leaf blades linear-lanceolate; flat, or rolled (convolute). Ligule a fringe of hairs.

Inflorescence paniculate; contracted; espatheate (but panicles enclosed by spathe-like upper leaf sheaths). Spikelet-bearing axes persistent.

Spikelets 7–10 mm long; compressed laterally; disarticulating above the glumes. Callus long. Glumes two; more or less equal; much exceeding the spikelets; awnless; similar (papery). All florets female-fertile, or with distal incomplete florets, these merely underdeveloped, awned; proximal incomplete florets absent.

Female-fertile florets 2–5. Lemmas similar in texture to the glumes (papery); hairy (hairs in 6 to 8 bristle-tipped



Fig. 39. Pl. 34.

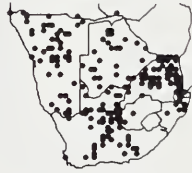


Fig. 40. *Centropodia glauca*

tufts, in transverse rows, with a transverse row of tufts level with the base of the awn, as well as longitudinal rows of hairs); without a germination flap; 7–11 nerved; incised; awned. Awns 1, or 3; median, or median and lateral (by small straight extensions from the lobes). The median awn different in form from the laterals (when laterals present); from the sinus; geniculate; much shorter than the body of the lemma to about as long as the body of the lemma. Palea present; relatively long (almost equalling the lemma); 2-nerved. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; pericarp fused; embryo large.

Photosynthetic pathway. C_4 ; biochemical type and ultrastructure need investigating, in view of the peculiarity of other C_4 arundinoids and especially in view of the variation in PCR sheath form; $XyMS+$.

Cytology, classification, distribution. Chromosome base number, $x = 12$. Arundinoideae; Danthonieae. 4 species. North Africa, South and South West Africa and Middle East. Xerophytic; in open habitats. Namibia, Botswana, and Cape Province. 2 indigenous species.

References. 1. Cope. 1982. Kew Bull. 37: 657. 2. Conert. 1962. Senck. Biol. 43: 239–266. 3. Ellis. 1984. Bothalia 15: 153–159.

Species treatment by N.P. Barker.

- 1(0). Central awn of lemmas 3–5 mm long; panicle 30–120 mm long; spikelets 3(–4)-flowered; plants to 750 mm tall ***C. glauca***
Central awn of lemmas 10–16 mm long; panicle 150–270 mm long; spikelets 4–6-flowered; plants 600–1500 mm tall ***C. mossamedensis***

***Centropodia glauca* (Nees) T.A. Cope**

Fig. 40. Pl. 35.

(=*Asthenatherum forskahlei* auctt., non (Vahl) Nevski) 1; (= *Asthenatherum glaucum* (Nees) Nevski) 1; (= *Danthonia glauca* Nees) 1.

Weakly perennial, or annual; tufted; 200–750 mm tall. Leaf blades to 110 mm long; 8–10 mm wide. Spikelets 7.5–10.0 mm long. Lower leaf sheaths loose and densely hairy; panicle 30–120 mm long; spikelets 3(–4)-flowered, lower 2 bisexual, upper usually male; glumes 6.5–10.0 mm long; central lemma awn 3–5 mm long.

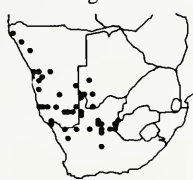
Flowering September to May. Loose, sandy substrates, almost exclusively on dunes. Common (at foot of sand dunes). Biome: Savanna, Nama-Karoo, Succulent Karoo and Desert. Endemic. Tends to be annual on dunes and perennial in gravel flats between dunes. Two varieties have been described but are not recognised here because the character upon which they are separated (leaf indumentum) is variable with habitat, an observation supported by the work of Ellis (1984).

Description: Conert 1962 (252), Launert 1970 (160:35), Stapf 1898–1900 (534), Chippindall 1955 (246). Illustration: Conert 1962 fig. 4–6, Chippindall 1955 (fig. 218.). Voucher: Ellis 4337. PRECIS code 9902035–00100.

***Centropodia mossamedensis* (Rendle) T.A. Cope**

(=*Asthenatherum mossamedense* (Rendle) Conert) 1; (= *Danthonia mossamedensis* Rendle) 1.

Perennial; rhizomatous and tufted; 600–1500 mm tall. Leaf blades to 200 mm long; to 7 mm wide. Spikelets 18–24 mm long.



Rhizome woody, bulbous, covered in hairy scales; lower sheaths usually absent, but if present then not hairy; panicle 150–270 mm long; spikelets 4–6-flowered; glumes 17–24 mm long; central lemma awn 10–16 mm long.

Flowering March to June. Riverbeds and drainage lines. Locally common. Biome: Nama-Karoo and Desert. Anatomically similar to *C. glauca* (Ellis 1984).

Description: Conert 1962 (254), Launert 1970 (160:36), Chippindall 1955 (246.). Illustration: Conert 1962 fig. 7–8. Voucher: Oliver, Muller & Steenkamp 6711. PRECIS code 9902035–00200.

***Chaetobromus* Nees**

Perennial; long-rhizomatous (sometimes), or caespitose, or decumbent. Culms 150–750 mm high; herbaceous; branched above (but not profusely). Plants unarmed. Leaf blades linear to linear-lanceolate; flat, or folded. Ligule a fringe of hairs.

Inflorescence paniculate (rarely racemose, in depauperate plants); open, or contracted (sometimes with few spikelets); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 10–17 mm long; compressed laterally; falling with the glumes (the hairs on the persistent pedicel allowing the spikelet to move in only one direction). Callus long. Glumes two; more or less equal; about equalling the spikelets, or much exceeding the spikelets; awnless; similar (subherbaceous, with scarios margins). Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.



Fig. 41. *Chaetobromus dregeanus*

Female-fertile florets (2–)3–4(–6). Lemmas less firm than the glumes to similar in texture to the glumes (membranous); hairy (mostly), or hairless (L1); 7–9 nerved; incised; awned (but the L1 sometimes with a reduced awn or awnless). *Awns* 1, or 3; median, or median and lateral (the lateral lemma lobes sometimes bristle-tipped). The median awn different in form from the laterals (when laterals present); from the sinus (mostly), or apical (sometimes, in the L1); geniculate (and twisted below); much longer than the body of the lemma. Palea present; relatively long; 2-nerved. Lodicules fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum long-linear; pericarp fused.

Photosynthetic pathway. C_3 (probably — though the lateral cell count is low between all but a few bundles, at least in *C. dregeanus*); $XyMS+$.

Cytology, classification, distribution. Arundinoideae; Danthonieae. 2–3 species. Southern Africa. Xerophytic; commonly maritime-arenicolous, or glycophytic (generally on sandy soil). Namibia and Cape Province. 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Ellis. 1988. Bothalia. 18: 195–209.

This genus appears to be a polyploid series ($2n = 12-72$) and is in a taxonomically chaotic state because of much intra-taxon variation. It is divisible into two groups, based on size differences in the floral parts, possibly related to differences in chromosome numbers. (Spies, Du Plessis & Barker, in prep.). The species accepted here are therefore possibly artificial, and only two of the four published names are used.

Species treatment by N.P. Barker.

- 1(0). Some or all basal leaves densely pubescent, hairs silky and appressed; glumes 9–12 mm long; lemma backs of upper florets densely pubescent, hairs short, erect; central awn of lemma of basal floret usually not geniculate *C. involucratus*
 Basal leaves glabrous or sparsely pubescent, hairs then not appressed; glumes 12–17 mm long; lemma backs of upper florets glabrous or pubescent, hairs then lax and not very dense; central awn of lemma of basal floret usually geniculate .. *C. dregeanus*

Chaetobromus dregeanus Nees

Perennial; stoloniferous, or tufted; to 600 mm tall. Leaf blades to 270 mm long; 5 mm wide (occasionally wider). Spikelets 12–18 mm long (excluding awns); to 10 mm wide. Leaves glabrous or sometimes sparsely pubescent; spikelets 2–4-flowered; glumes 12–17 mm long; lemma back of basal floret glabrous or sparsely hairy, lemma backs of upper florets glabrous or pubescent, the hairs then lax; basal lemma body 4–5 mm long, lemma lobes usually absent; body of upper lemmas 2.8–5.5 mm long with lobes attenuating into bristles; central awn of basal and upper florets usually geniculate.

Flowering August to November (occasionally later). Sandy areas and rocky hillsides in low rainfall areas. Common (Strandveld, Namaqualand coastal belt and Namaqualand Broken Veld, occasionally in Fynbos). Biome: Fynbos, Nama-Karoo, Succulent Karoo, and Desert. Endemic. Natural pasture. Ellis (1988) describes four anatomical forms within the genus, three of which are included under this concept of *C. dregeanus*.

Description: Stapf 1898–1900 (538), Chippindall 1955 (373). Illustration: Chippindall 1955 (fig. 246). Voucher: Goldblatt 2558. PRECIS code 9902060–00100.

Fig. 41. Pl. 36.



Chaetobromus involucratus (Schrad.) Nees

Perennial; stoloniferous, or tufted; to 300 mm tall. Leaf blades to 120 mm long; to 6 mm wide. Spikelets 9–14 mm long (excluding awns); 10 mm wide. Some or all basal leaves and sheaths covered in long, silky, appressed hairs; spikelets 3–4-flowered; glumes 9–12 mm long; lemma back of basal floret glabrous, lemma backs of upper florets densely covered in short, erect hairs; basal lemma body 2.5–4.0 mm long, lemma lobes absent; lemma body of upper florets 1.8–3.0 mm long, lobes attenuating into bristles; central awn of basal floret usually not geniculate.

Flowering August to October (and occasionally later). Coastal areas of the northern Cape. Locally common (Port Nolloth). Biome: Succulent Karoo and Desert. Endemic. Ellis (1988) considers the anatomical form corresponding to this species to be anatomically distinct because of the presence of silky macrohairs, which however are not visible on all leaves of the plant, often appearing only on some of the most basal leaves.

Description: Stapf 1898–1900 (537), Chippindall 1955 (274). Voucher: De Winter 9549. PRECIS code 9902060–00200.



Chloris O. Swartz

Actinochloris Steud., *Agrostomia* Cerv., *Apogon* Steud., *Chloridopsis* Hack., *Chloropsis* Kunze, *Chlorostis* Raf., *Geopogon* Steud., *Heterolepis* Boiss., *Leptochloris* Kunze, *Phacellaria* Steud., *Trichloris* Benth.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 100–3000 mm high; herbaceous. Leaf blades linear; flat, or folded, or rolled. Ligule a fringed membrane to a fringe of hairs.

Inflorescence of spike-like main branches; digitate or subdigitate (except *C. roxburghana*); espathate. Spikelet-bearing axes persistent.

Spikelets solitary, or in pairs; biseriate; not in distinct 'long-and-short' combinations; 1.8–5.5 mm long; compressed laterally; disarticulating above the glumes (the glumes usually persistent). Hairy callus present (usually minute). Glumes two; very unequal; decidedly shorter than the adjacent lemmas, or long relative to the adjacent lemmas; awnless; similar to very dissimilar (narrow, membranous, or the lower sometimes subulate). Incomplete florets 2–5, distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 1 (rarely 2). Lemmas similar in texture to the glumes, or decidedly firmer than the glumes (membranous or cartilaginous); 1–7 nerved; entire (truncate), or incised; awned. Awns 1 (usually), or 3; median, or median and lateral (rarely, *Trichloris*). The median awn similar in form to the laterals (when laterals present); from the sinus, or apical; non-geniculate. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; ellipsoid (to lanceolate); not noticeably compressed (subterete), or trigonous; hilum short; pericarp fused; embryo large (1/2 to 2/3 the grain length).

Photosynthetic pathway and related features. C_4 ; PCK (6 species); $XyMS+$. PCR sheath outlines uneven. PCR sheath extensions usually absent, or present (in *C. virgata*). Maximum number of extension cells in *C. virgata* 2. PCR cell chloroplasts ovoid; with well developed grana; centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. About 55 species. Tropical and warm temperate. Mesophytic, or xerophytic; in open habitats (diverse habitats,

mostly in short grassland on poor soil or disturbed ground). Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (7), naturalized species (1).

Intergeneric hybrids with *Cynodon* — *X Cynochloris* Clifford & Everist: several species involved.

References. 1. Clayton et al. 1974. FTEA. 2. Renvoize. 1977. Kew Bull. 31:844. 3. Clayton. 1982. Kew Bull. 37: 419.

Species treatment by M. Koekemoer.



Fig. 42. *Chloris pycnothrix*

- 1(0). Spikes numerous, arranged on a long central axis; axis 60–180 mm long ***C. roxburghiana***
Spikes fewer than 20, digitate or subdigitate 2
- 2(1). Upper glumes with a distinct, dense rim of silky white hairs on the margins; spikes stout and shorter than 30 mm ***C. flabellata***
Upper glumes scabrid or glabrous on the margins; spikes slender and usually longer than 30 mm 3
- 3(2). Leaf blades distinctly or slightly rounded at the tips 4
Leaf blades acuminate or tapering to a fine point 6
- 4(3). Leaf blades blunt and broadly rounded at the tips; lemma awns 11–27 mm long ***C. pycnothrix***
Leaf blades tapering to a fine rounded tip; lemma awns 6–11 mm long 5
- 5(4). Spikes 6–10, long, slender, flexuous, spreading almost horizontally, 70–150 mm long; plants flowering in winter ***C. truncata***
Spikes usually 4–6, rather coarse, firm, never horizontally spreading, 30–80 mm long; plants flowering in summer ***C. mossambicensis***
- 6(3). Spikelets distant, more or less their own length apart; spikes slender, flexuous; lowest spikes almost horizontally spreading ***C. diluta***
Spikelets imbricate, overlapping for most of their length; spikes firm, usually erect but not spreading more than 45 degrees from the central axis 7
- 7(6). Lemma tips concealed by a tuft of stiff, erect hairs; awns 5–15 mm long, at least four times the length of the body; spikelets delicate; uppermost leaf sheaths often inflated around the young inflorescences; plants not more than 900 mm tall ***C. virgata***
Lemma tips truncate; awn 2–10 mm long, shorter than to as long as the body; spikelets rather coarse; uppermost leaf sheath not inflated; plants 500–2200 mm tall ***C. gayana***

***Chloris diluta* Renvoize**

Perennial; rhizomatous and stoloniferous; 300–1000 mm tall. Leaf blades 100–300 mm long; 4–7 mm wide. Spikelets 3–4 mm long. Culms wiry, usually erect; leaf blades acuminate; spikes 4–6, 50–80 mm long; spikelets more or less their own length apart; lower glume 2.0–2.5 mm long; lowest lemma 3.5 mm long, with awn 2–8 mm long.

Flowering March to June. In scrub forest on river banks. Rare. Biome: Savanna. Zimbabwe. Similar to *Chloris pycnothrix*, which has leaf blade tips broadly rounded and lemma awns 11–27 mm long, and *C. truncata*, which has leaf tips finely rounded and spikes 6–10.

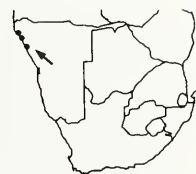
Description: Renvoize 1977 (844). Voucher: Scheepers 1138. PRECIS code 9903010-00050.



***Chloris flabellata* (Hack.) Launert**

Swardforming perennial; stoloniferous (stolons stout and woody); 200–450 mm tall. Leaf blades 50–80 mm long; 3–5 mm wide. Spikelets 2.5–3.5 mm long. Spikes stout, curved inwards, 10–30 mm long; lower glume 1.5 mm long; upper glume with a dense rim of white silky hairs; lemma 2.5 mm long.

Flowering December to April. Confined to coastal regions on saline marshes or flats, also in sandy, muddy places and edges of reed beds. Rare. Biome: Desert. Coastal



regions of southern Angola. Erosion control. The silky edge of the upper glume is very characteristic and does not occur in any other southern African species of this genus.

Description: Launert 1970 Mitt. Bot. Munch. 8. Voucher: Tinley 1626. PRECIS code 9903010-00100.

Chloris gayana Kunth

Rhodes grass.

Perennial; stoloniferous and tufted; 500–1200 mm tall. Leaf blades 250–500 mm long; 3–9 mm wide. Spikelets 3–5 mm long. Basal leaf sheaths strongly keeled; spikes 7–20, 40–150 mm long; spikelets overlapping for most of their length; lower glume 1.5–2.5 mm long; lowest lemma 2.5–3.5 mm long, awn 1–10 mm long, shorter than or as long as the body of the lemma.

Flowering November to May. Riverine woodland to open veld on well drained soils. Common. Naturalized from India. Biome: Fynbos, Savanna, and Grassland. Tropical Africa to China; cultivated pasture in Australia, New Zealand and North America. Pasture (planted as forage). Very similar to *C. virgata*, which is larger and has a tuft of stiff, erect hairs on the lemma tips.

Description: Chippindall & Crook 1976 (2), Stapf 1898–1900 (642), Hitchcock & Chase 1950 (502), Chippindall 1955 (197), Clayton et al. 1970–1982 (346). Illustration: Chippindall 1955 (plate 7), Hitchcock & Chase 1950 (fig. 1065). Voucher: Scheepers 941. PRECIS code 9903010-00200.

Chloris mossambicensis K. Schum.

(=*Tetrapogon mossambicensis* (K. Schum.) Chippind. ex Fisher) 1.

Robust perennial; rhizomatous and stoloniferous; 150–800 mm tall. Leaf blades 100–350 mm long; 3–6 mm wide. Spikelets 2–4 mm long. Basal leaf sheaths strongly keeled; spikes usually 4–5, yellowish, 30–80 mm long; spikelets coarse; lower glume 1.7–2.0 mm long; upper glume 2.75–3.50(–4.0) mm long; lowest lemma 2–3(–4) mm long, awns two, 4–11 mm long.

Flowering October to April. Along rivers or on seasonally flooded pans on clayey, waterlogged and turf soils. Infrequent. Biome: Savanna and Grassland. Southern tropical Africa.

Description: Clayton et al. 1970–1982 (341). Illustration: Clayton et al. 1970–1982 (fig. 96(5)). Voucher: Bredenkamp 1525. PRECIS code 9903010-00250.

Chloris pycnothrix Trin.

Spiderweb chloris.

Usually annual, or perennial; tufted; 150–500 mm tall. Leaf blades 20–100 mm long; 3–5 mm wide. Spikelets 2–3 mm long. Leaves with rounded and blunt tips; spikes 4–9, delicate, narrow, 40–100 mm long, horizontally spreading; lower glume 1.5–3.0 mm long; lowest lemma 2.5–3.2 mm long, tips acuminate to acute, awns 11–27 mm long.

Flowering September to May. In cultivated lands, disturbed areas and on roadsides in shallow stony soils. Common. Biome: Savanna and Grassland. Tropical Africa, tropical South America. Erosion control (pioneer), or weed (in disturbed places). Similar to *C. diluta*, in which the

spikelets are distant, about their own length apart and the lemma awn 2–8 mm long, and *C. truncata*, which has leaf blades with fine round tips and lemma awns 6–11 mm long.

Description: Chippindall & Crook 1976 (3), Stapf 1898–1900 (641), Chippindall 1955 (198), Clayton et al. 1970–1982 (340). Illustration: Chippindall 1955 (fig. 173). Voucher: Smook 5593. PRECIS code 9903010-00350.

Chloris roxburghiana Schult.

(=*C. myriostachya* Hochst.) 1.

Perennial; rhizomatous and tufted; 700–1250 mm tall. Leaf blades 100–400 mm long; 2–10 mm wide. Spikelets 1–3 mm long. Panicle dense, axis 40–100 mm long; spikes numerous, 30–80 mm long; spikelets 3–4 flowered; lower glume 1.0–1.5 mm long; upper glume 2.0–2.8 mm long; lowest lemma 1.5–2.0 mm long, awns 8–17 mm long.

Flowering November to May. Dry, sandy or stony soil on river banks, in open veld or disturbed places. Locally common. Biome: Savanna. Central tropical Africa and southern India. The inflorescence is strikingly different from other southern African *Chloris* species, which have digitate or subdigitate racemes.

Description: Chippindall 1955 (196), Clayton et al. 1970–1982 (338). Illustration: Chippindall 1955 (fig. 171). Voucher: Godfrey SH 1729. PRECIS code 9903010-00500.

Chloris truncata R. Br.

Perennial; stoloniferous and tufted; 250–450 mm tall. Leaf blades 30–200 mm long; 2–3 mm wide. Spikelets 2 mm long. Spikes 6–10, 80–150 mm long, flexuous, spreading horizontally; spikelets overlapping about half their length; awns 6–12 mm long.

Flowering June to July. Disturbed places and lucerne paddocks. Infrequent. Naturalized, or invader (possibly) from Australia. Biome: Fynbos. Ornamental (occasionally cultivated in grass gardens), or weed (in lucerne). Introduced weed that seems to be spreading in the winter rainfall area. Similar to *C. pycnothrix*, which has longer awns, and *C. diluta*, which has spikelets about their own length apart.

Description: Hitchcock & Chase 1950 (509). Voucher: P.C.V. du Toit 2172. PRECIS code 9903010-00550.

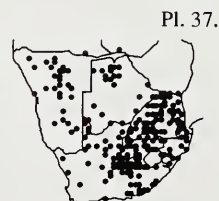
Chloris virgata Swartz

Feathered chloris, klossiegars.

Usually annual, or perennial; tufted; 300–750 mm tall. Leaf blades 100–300 mm long; 2–6 mm wide. Spikelets 3.0–3.5 mm long. Upper leaf sheaths inflated; spikes 7–15, 20–80 mm long, erect, silky-feathery; lower glume 1.5–2.5 mm long; upper glume 2.5–4.5 mm long; lowest lemma 2.5–4.0 mm long, with a crown of spreading hairs 1.5–4.0 mm long at the apex; awns 2–15 mm long.

Flowering December to June. Disturbed places on a variety of soil types. Common. Biome: Savanna, Grassland, Nama-Karoo, Succulent Karoo, and Desert. Worldwide in tropical and temperate countries. Pasture (good grazing and hay), or weed (disturbed areas). Very similar to *C. gayana*, which lacks the tuft of hairs on the lemma tips.

Description: Chippindall & Crook 1976 (4), Stapf 1898–1900 (641), Hitchcock & Chase 1950 (504), Chippin-



dall 1955 (197), Clayton et al. 1970–1982 (343). Illustration: Chippindall 1955 (fig. 172), Clayton et al. 1970–1982 (fig. 97). Voucher: Smook 5122. PRECIS code 9903010–00600.

Chrysopogon Trin.

Centrophorum Trin., *Chalcoelytrum* Lunell, *Pollinia* Spreng., *Raphis* Lour., *Trianthium* Desv.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 150–1500 mm high; herbaceous; usually unbranched above. *Ligule a fringed membrane (short), or a fringe of hairs. Plants bisexual, with bisexual spikelets; with hermaphrodite florets. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (pedicellate spikelets flattened dorsally, awnless or not; often the sessile spikelet pallid or yellowish, the pedicellate spikelet purple).*

Inflorescence paniculate; open (with whorls of slender, persistent branches); espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes very much reduced (usually to a single joint and the terminal triad, but sometimes with a long-pedicel/short-pedicel pair below); with very slender rachides; disarticulating at the joints (beneath the triad, and beneath the pairs when present). 'Articles' without a basal callus-knob.

Spikelets in triplets, or in triplets and in pairs; consistently in 'long-and-short' combinations; these pedicellate/ sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only or sterile, on slender flat pedicels, dorsally compressed, awned or awnless, L1 empty, L2 usually with a male floret. *Female-fertile spikelets* 5–8.5 mm long; *compressed laterally*; falling with the glumes. Glumes two; more or less equal; awned and awnless (G2 often awned), or awnless. Lower glume convex on the back (or keeled upwards, sometimes with spinulose margins). *Proximal incomplete florets* 1; epaleate; sterile.



Fig. 43. *Chrysopogon serrulatus*

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire, or incised; awned. Awns 1; median; from the sinus, or apical; geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma (?). Palea present, or absent; when present conspicuous but relatively short, or very reduced. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 25 species. Tropical and subtropical. Mesophytic, or xerophytic (from rainforest to subdesert); in open habitats (on poor soils, often in disturbed ground); glycophytic. Botswana, Transvaal, and Cape Province. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Chrysopogon serrulatus Trin.

(=*C. montanus* Trin. var. *tremulus* (Hack.) Stapf) 1.

Krulgras, golden beard grass.

Perennial; sometimes rhizomatous and tufted; to 1000 mm tall. Leaf blades to 300 mm long; 2–10 mm wide. Spikelets (sessile and pedicellate) 5–8 mm long (but sessile laterally compressed, pedicellate dorsally compressed). Inflorescence branches long, whorled, bare below, terminated by a triad of spikelets.

Flowering December to April. Rocky hillsides, stony soils. Biome: Savanna, Grassland, and Nama-Karoo. Eastern Africa to tropical Asia.

Description: Chippindall 1955 (468), Clayton et al. 1970–1982 (736). Illustration: Chippindall 1955 (fig. 384). Voucher: Brueckner 121. PRECIS code 9900500–00200.

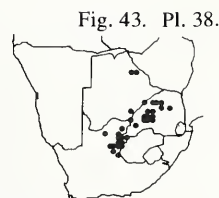


Fig. 43. Pl. 38.

Cladoraphis Franch.

A segregate of *Eragrostis*.

Perennial; long-rhizomatous, or long-rhizomatous and long-stoloniferous (occasionally). Culms 200–800 mm high; woody and persistent; branched above. Plants conspicuously armed (with pungent tipped leaf blades and inflorescence axes). Leaf blades linear-lanceolate to lanceolate; becoming rolled; hard, woody, needle-like. Ligule a fringe of hairs. The spikelets all alike in sexuality.

Inflorescence paniculate (with distant branches, or reduced to a single branch or cluster); open (but the lateral branches compact); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; not two-ranked; 7–16 mm long; compressed laterally; disarticulating above the glumes and between the florets (tardily). Glumes two; more or less equal; markedly shorter than the spikelets; awnless; similar. Incomplete florets distal to the female-fertile florets, merely underdeveloped, awnless; proximal incomplete florets absent.

Female-fertile florets 3–16. Lemmas similar in texture to the glumes; without a germination flap; 3 nerved; entire; awnless (muticous). Palea present; relatively long (equalling the lemmas or slightly shorter). Lodicules 2; fleshy. Stamens 3. Ovary glabrous. Fruit small (1.3 to 2 mm long); hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C_4 ; XyMS+. PCR sheath outlines uneven (owing to the adaxial extensions). PCR sheath extensions present (with most

bundles). Maximum number of extension cells 4–5. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 2 species. Southern Africa. Xerophytic; in open habitats; maritime-arenicolous (*C. cyperoides* on beach dunes), or glycophytic (*C. spinosa* on desert dunes and sandy beds of dry watercourses). Namibia and Cape Province. 2 indigenous species.

References. 1. Phillips. 1982. Kew Bull. 37:133.

Species treatment by M. Koekemoer.



Fig. 44. *Cladoraphis spinosa*

- 1(0). Inflorescences with primary branches less than their own length apart; primary branches spiny; spikelets 3–18-flowered, arranged on short intervals, usually almost perpendicular to the branches . *C. spinosa*
 Inflorescence with primary branches more than their own length (and often more than twice their length) apart; primary branches not always developed to a spine; spikelets 4–9(–20)-flowered, usually clustered and appressed to the branches *C. cyperoides*

Cladoraphis cyperoides (Thunb.) S.M. Phillips

(=*Eragrostis cyperoides* (Thunb.) Beauv.) 1.

Sedge-stemmed love grass, steekriet.



Spiny, bushy perennial; tufted; 200–800 mm tall. Leaf blades 20–110 mm long; 4–9 mm wide. Spikelets 4–8 mm long; 3–5 mm wide. Panicle branches more than their own length apart (often more than twice their length), not always produced as a spine, up to 80 mm long but usually much shorter; spikelets usually clustered and appressed to the branches, 4–9(–20)-flowered.

Flowering August to May (peak flowering from August to October). Deep loose sand, coastal dunes or on the edges of fresh or saltwater lagoons. Locally common (coast). Biome: Fynbos, Succulent Karoo, and Desert. Endemic, probably cultivated in Oregon USA. Occasionally grazed pasture and erosion control (stabilizing windblown dunes).

Description: Stapf 1898–1900 (611), Hitchcock & Chase 1950 (168), Chippindall 1955 (184). Voucher: Goldblatt 4244. PRECIS code 9902865–00100.

Cladoraphis spinosa (L. f.) S.M. Phillips

(=*Eragrostis spinosa* (L. f.) Trin.) 1.

Spiny love grass, volstruisdoring.



Spiny, bushy perennial; tufted; 200–600 mm tall. Leaf blades 10–60 mm long; 4–9 mm wide. Spikelets 6–18 mm long; 3–4 mm wide. Panicle branches less than their own length apart, spine-tipped, up to 50 mm long; spikelets usually almost perpendicular to the branches, arranged at short intervals, 3–18-flowered.

Flowering August to May (peak flowering from August to October). Well-drained, deep, loose sand on dunes and river margins. Locally common. Biome: Fynbos, Nama-Karoo, Succulent Karoo, and Desert. Endemic. Occasionally grazed pasture, or erosion control (stabilizing windblown sand dunes), or indicator (overgrazed veld).

Description: Stapf 1898–1900 (612), Chippindall 1955 (183). Illustration: Chippindall 1955 (fig. 158). Voucher: Ward 163. PRECIS code 9902865–00200.

Cleistachne Benth.

Annual. Culms 600–2500 mm high; herbaceous; usually unbranched above (sometimes with stilt roots). Leaf blades linear; rolled. *Ligule* an unfriable membrane (*scarious*). Plants bisexual, with bisexual spikelets.

Inflorescence paniculate; large, terminal, linear to lanceolate; espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (long, narrow, with many joints); with very slender rachides; persistent. 'Articles' densely long-hairy, or somewhat hairy (rachis and pedicels with grey or brown hairs).

Spikelets solitary (perhaps representing 'racemes' reduced to single spikelets: cf. *Sorghum*, *Sorghastrum*). *Female-fertile spikelets* 4–5 mm long (rarely 3 or 6 mm); *compressed dorsiventrally*; falling with the glumes (disarticulating from apex of pedicel). *Glumes* two; *more or less equal*; awnless; similar (leathery, with inrolled margins). *Proximal incomplete florets* 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); incised; awned. Awns 1; median; from

the sinus; geniculate; much longer than the body of the lemma. Palea present (but small); conspicuous but relatively short. Lodicules 2; fleshy; ciliate. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 1 species. Tropical Africa, India. Helophytic to mesophytic; in open habitats (riverbanks and old farmland); glycophytic. Transvaal. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

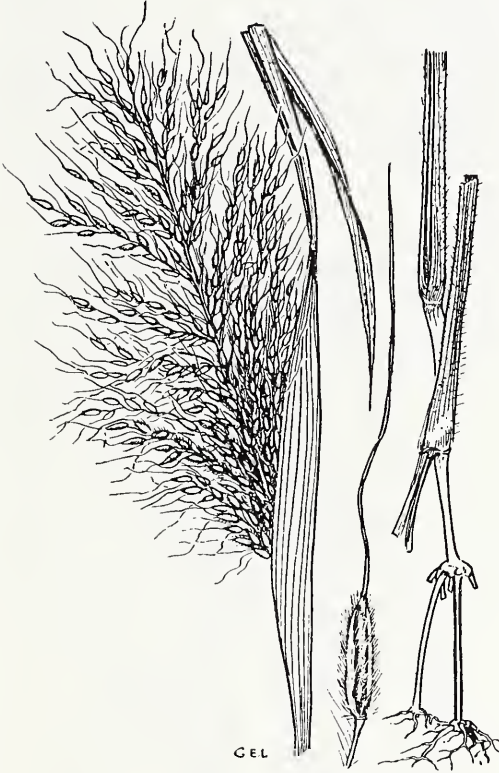


Fig. 45. *Cleistachne sorghoides*

Cleistachne sorghoides Benth.

Coarse, robust annual; to 2500 mm tall. Leaf blades to 1000 mm long; to 14 mm wide. Spikelets 4–5 mm long. Spikelets all alike, pedicellate, not paired, dark and glossy at maturity.

Flowering February to April. Riverbanks and vleis. Conservation status not known. Biome: Savanna and Grassland. Through eastern tropical Africa to India.

Description: Chippindall 1955 (468). Illustration: Chippindall 1955 (fig. 383), Clayton et al. 1970–1982 (fig. 170). Voucher: Vermeulen April 1952. PRECIS code 9900480–00100.

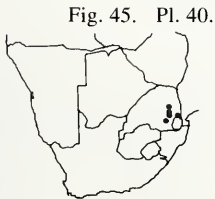


Fig. 45. Pl. 40.

Coelachyrum Hochst. & Nees

Sometimes includes *Cypholepis* Chiov.

Perennial; caespitose (densely). Culms 300–1000 mm high; herbaceous. Leaf blades linear; usually flat. Ligule a fringed membrane.

Inflorescence of spike-like main branches; non-digitate; distant, erect. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; short pedicellate; 5–10 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. Glumes two; more or less equal; long relative to the adjacent lemmas; awnless; similar (lanceolate, membranous). Incomplete florets distal to the female-fertile florets, male; proximal incomplete florets absent.

Female-fertile florets 7–10. Lemmas decidedly firmer than the glumes (membranous, becoming cartilaginous below); hairy (pilose with club-shaped hairs on the lower back); 3 nerved; entire; awnless. Palea present; conspicuous



Fig. 46. *Coelachyrum yemenicum*

but relatively short (about half lemma length). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous (?). Fruit small (1.2–1.4 mm); hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR sheath outlines uneven. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 1 species. Northeast to southeast and southern Africa. Xerophytic; in open habitats. Namibia, Botswana, Transvaal, and Cape Province. 1 indigenous species.

References. 1. Phillips. 1982. Kew Bull. 37: 133.

Species treatment by M. Koekemoer.

Coelachyrum yemenicum (Schweinf.) S.M. Phillips

(=*Cypholepis yemenica*
(Schweinf.) Chiov.) 1.

Perennial; slender, densely tufted (culms erect or geniculate); 310–630 mm tall. Leaf blades 70–320 mm long; 2.5–5.5 mm wide. Spikelets 5–10 mm long. Leaf sheaths keeled; racemes 2–8, far apart; spikelets 7–12-flowered; lemma with club-shaped hairs near the base.

Flowering February to June. Calcareous pans, shallow limestone, often in light shade. Infrequent. Biome: Savanna and Nama-Karoo. Eastern Africa to Yemen.

Description: Chippindall 1955 (121). Clayton et al. 1970–1982 (248). Illustration: Chippindall 1955 (fig. 94). Clayton et al. 1970–1982 (fig. 69). Voucher: Paton 3156. PRECIS code 9903360–00100.



Fig. 46. Pl. 41.

Coelorhachis Brongn.

Apogonia Nutt, *Cycloteria* Stapf.

Perennial; mostly robust, tall, forming clumps. Culms 700–4000 mm high; herbaceous (coriaceous); branched above. Leaf blades linear; flat (or rarely filiform). Ligule a fringed membrane to a fringe of hairs. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic, or homomorphic.

Inflorescence of spike-like main branches, or paniculate (of long-peduncled, spikelike 'racemes', solitary at culm or branchlet apices, often in 'false panicles'); spatheate; a complex of 'partial inflorescences' and intervening foliar organs (the unit consisting of 'raceme', its peduncle, subtending leaf and next internode (peduncle of the unit)). Spikelet-bearing axes spike-like; solitary, or clustered (fascicled); with substantial rachides; disarticulating at the joints. 'Articles' non-linear (concave, clavate, shorter than the sessile spikelet); with a basal callus-knob.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis (but closely contiguous). The sessile spikelets hermaphrodite. The pedicellate spikelets hermaphrodite (rarely), or male-only, or sterile. Female-fertile spikelets 3–4.5 mm long; compressed dorsiventrally; falling with the glumes. Glumes two; more or less equal; awnless; very dissimilar (lower two-keeled and two-winged above, upper 1-keeled and wingless). Proximal incomplete florets 1; epaleate, or paleate, palea reduced; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. About 20 species. Mainly tropical.

Helophytic to mesophytic; in open habitats (grassland and savanna, often on damp soils); glycophytic. Natal and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Veldkamp. 1986. Blumea 31: 281.

Species could be transferred to *Mnesithea* Kunth.

Species treatment by G.E. Gibbs Russell.

Coelorhachis capensis Stapf

Perennial; tufted; to 700 mm tall. Leaf blades 3–8 mm wide. Spikelets (sessile) 4.5–5 mm long (pedicellate smaller, sometimes much reduced). Raceme narrowly cylindrical, culm-like, with sunken spikelets.

Flowering September to March. Grassveld. Infrequent. Mozambique.

Description: Chippindall 1955 (523). Illustration: Chippindall 1955 (fig. 417). Voucher: Sim 2733. PRECIS code 9900290–00100.

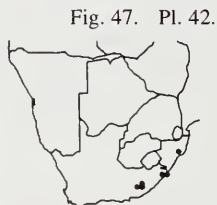


Fig. 47. Pl. 42.



Fig. 47. *Coelorhachis capensis*

Coix L.

Lacryma Medik, *Lacryma-jobi* Ort., *Lacrymaria* Fabric., *Sphaerium* Kuntze.

Annual to perennial; stems erect or straggling, prop-roots from the lower nodes. Culms 700–4000 mm high; herbaceous; branched above. Leaf blades lanceolate; flat. Ligule an unfringed membrane to a fringed membrane. Plants monoecious with all the fertile spikelets unisexual. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic.

Inflorescence paniculate (but peculiar — see below); spatheate; a complex of 'partial inflorescences' and intervening foliar organs (the partial inflorescences of peculiar form, on flattened peduncles, in leafy panicles). Spikelet-bearing axes very much reduced (*the female 'raceme' usually represented by three spikelets, enclosed in a globose, hardened involucre or utricle 6–12 mm long, separated from the male raceme by a prophyll at its base. Male raceme exerted on a peduncle through the apex of the involucre*); disarticulating; falling entire (within its involucre).

Spikelets consistently in 'long-and-short' combinations;



Fig. 48. *Coix lacryma-jobi*

these pedicellate/sessile (in both male and female racemes). The sessile spikelets of the female racemes female-only. The pedicellate spikelets of the female racemes female-only, or sterile. Female-fertile spikelets falling with the glumes. Glumes two; more or less equal; awnless; very dissimilar (both beaked; the lower subglobose, hyaline below, subcartilaginous above; the upper narrower, strongly keeled, subhyaline). Proximal incomplete florets 1; epaleate; sterile. Male spikelets in pairs or triads, several per disarticulating male raceme; dorsally compressed, with two florets, both male or the lower sterile.

Female-fertile florets 1. Lemmas less firm than the glumes, or similar in texture to the glumes (similar to the upper glume, but less strongly keeled; very thin and hyaline beneath the beak); entire; mucronate (beaked). Palea present; conspicuous but relatively short (broad, beaked). Stamens 0 (or 3 staminodes). Ovary glabrous. Fruit medium sized; hilum short (circular or elliptical, quite large); embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$. Panicoideae; Andropogonodae; Maydeae. 5 species. Tropical Asia. Helophytic to mesophytic; in shade, or in open habitats (forest margins and swamps); glycophytic. Transvaal, Natal, and Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Coix lacryma-jobi L.

Job's tears.

Annual; 900–1200 mm tall. Leaf blades 100–500 mm long; 2–7 mm wide. Spikelets 7–10 mm long (unisexual). Inflorescence involucre is hard, whitish and beadlike.

Flowering August to April. Damp places. Infrequent. Naturalized (cultivated in warm areas worldwide); originally from the East Indies. Domestic use (beads), or weed (ruderal).

Description: Chippindall 1955 (504), Clayton et al. 1970–1982 (857). Illustration: Chippindall 1955 (fig. 419), Clayton et al. 1970–1982 (fig. 205). Voucher: Smook 1298. PRECIS code 9900020–00100.



Fig. 48. Pl. 43.

Colpodium Trin.

Including *Paracolpodium*, *Keniochloa*.

Perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 100–300 mm high; herbaceous; unbranched above. Sheath margins joined to free. Leaf blades flat. Ligule an unfringed membrane.

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets 2–8 mm long; compressed laterally to not noticeably compressed; disarticulating above the glumes. Hairy callus absent. Glumes two; relatively large; more or less equal; decidedly shorter than the adjacent lemmas, or long relative to the adjacent lemmas; awnless; similar. All florets female-fertile, or distal incomplete florets also present, merely underdeveloped, awnless; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas similar in texture to the glumes, or decidedly firmer than the glumes; 3–5 nerved; incised; awnless. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit medium sized; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 2$. Pooideae; Poodae; Poeae. *Sensu stricto*, 3 species (?). North temperate. Natal and Lesotho. 1 indigenous species.

References. 1. Clayton. 1970. FTEA. 2. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.

Colpodium hedbergii (Meld.) Tzvel.

(=*Catabrosia aquatica* auctt., non (L.) Beauv.) l.

Fig. 49. Pl. 44.



Perennial; hydrophyte, stoloniferous, and tufted; 100–250 (–300) mm tall. Leaf blades 20–60 (–150) mm long; 3–5 mm wide. Spikelets 2.5–4.0 mm long. Leaf blades strongly keeled, folded when young; panicle 40–120 mm long with spreading branches which have the lower part bare; spikelets 1-flowered; glumes subequal, slightly longer than the lemma.

Flowering December to March. Wet places, in streams and sedge meadows at high altitudes, 2900–4000 m. Rare. Locally common. Biome: Grassland. Kenya. The South



Fig. 49. *Colpodium hedbergii*

African specimens do not fit satisfactorily into this species and Hedberg (pers. comm.) regards our specimens as representing a new taxon.

Description: Linder (57), Clayton et al. 1970–1982 (51). Voucher: Killick 4414, PRECIS code 9904100–00100.

Cortaderia Stapf

Moorea Lemaire.

Perennial; caespitose (mostly large, tussocky). Culms 1000–4000 mm high. Leaf blades disarticulating from the sheaths (the sheaths disintegrating or rolling). Ligule a fringe of hairs. Plants bisexual, with bisexual spikelets, or dioecious (being exclusively gynodioecious). The spikelets all alike in sexuality (i.e., on the same plant).

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets 10–18 mm long; compressed laterally; disarticulating above the glumes. *Callus* long. Glumes two; more or less equal; about equalling the spikelets; awnless; similar. Incomplete florets distal to the female-fertile florets, merely underdeveloped; *proximal incomplete florets* absent.

Female-fertile florets 2–3 (–5). Lemmas similar in texture to the glumes to decidedly firmer than the glumes (membranous); hairy (hairs in tufts, or not in tufts; in transverse rows, or not in transverse rows); 3 nerved; entire, or incised; awned. Awns 1, or 3; median, or median and lateral (via the lateral lobes). The median awn similar in form to the laterals (or somewhat more flattened, when laterals present); from the sinus, or apical; non-geniculate to geniculate. Palea present; relatively long; 2-nerved. Lodicules 2; fleshy; ciliate. Stamens 3, or 0 (in female plants of dioecious species). Ovary glabrous. Hilum long-linear; pericarp fused; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Arundinoideae; Danthonieae. 24 species. New Zealand, South America. Mesophytic to xerophytic; in open habitats (on hillsides, among scrub and in weedy places). Transvaal, Natal, and Cape Province. 2 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Robinson. 1984. S. Afr. J. Bot. 3: 343.

Species treatment by E.R. Robinson & G.E. Gibbs Russell.

1(0). Leaves bright green, tips not setaceous, blades flat or slightly V-shaped in cross-section, reaching only to 1/2 culm height; glume veins and rachillas purple

..... **C. jubata**

Leaves glaucous, tips setaceous, blades often V-shaped in cross section, usually reaching more than 2/3 culm height; glume veins and rachillas white

..... **C. selloana**

Cortaderia jubata (Lem.) Stapf

Perennial; tufted (densely); to 3000 mm tall. Leaf blades 1000–1500 mm long; 9–12 mm wide. Robust, leaves mostly basal, to half the height of the culm, bright green, with cutting margins and midrib, flat or only slightly V-shaped in cross section, tips not setaceous; panicle 600–800 mm long; (1–)3–5 florets per spikelet, all florets are female





Fig. 50. *Cortaderia selloana*

only; glumes approximately equal, 9–13 mm long; glume veins, rachises and rachillas purple; lemmas 8–11(–15) mm long.

Flowering November to February (rarely to March). Disturbed places. Invader from high Andes of South America. Erosion control (on mine dumps), or ornamental (widely cultivated), or weed. Reproduces by agamospermy. PRECIS code 9902110–00050.

***Cortaderia selloana* (Schult.) Aschers. & Graebn.**

Fig. 50. Pl. 45.

Perennial; densely tufted; to 4000 mm tall. Leaf blades 800–1800 mm long; 8–10 mm wide. Robust, leaves mainly basal, glaucous, to 2/3 culm height; blades with cutting margins and midrib, usually markedly V-shaped in cross section, tips setaceous; panicle 400–600 (–700) mm long; spikelets either female or hermaphrodite



(but then functionally male); female-fertile spikelets with (5–)6(–7) florets per spikelet, hermaphrodite spikelets with (1–)3(–4) florets; glumes of equal length, 8–15 mm long; glume veins, rachises and rachilla colourless; lemmas of female-fertile florets 10–14 mm long, those of hermaphrodite florets 12–15 mm long.

Flowering February and April. Seasonally wet habitats. Invader (in the PWV area) from low lying riverbanks in South America. Ornamental and weed (spreading in the southern Transvaal).

Description: Chippindall 1955 (230). Illustration: Chippindall 1955 (fig. 204). PRECIS code 9902110–00100.

***Corynephorus* P. Beauv.**

Including *Anachortus*.

Annual, or perennial; caespitose. Culms 100–600 mm high; herbaceous; unbranched above. Leaf blades linear; folded, or rolled. Ligule an unfringed membrane.

Inflorescence paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 3–5 mm long; compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; about equalling the spikelets; awnless; similar (lanceolate). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 2. Lemmas similar in texture to the glumes; 1 nerved; incised; awned. Awns 1; median (with



Fig. 51. *Corynephorus fasciculatus*

a clavate apex enclosed by the glumes, and with a ring of minute hairs distal to the twisted lower half); dorsal; geniculate; much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. 5 species. Europe, Mediterranean. Xerophytic; in open habitats (in sandy places, often coastal). Cape Province. 1 naturalized species.

References. 1. Tutin. 1980. Fl. Europ.

Species treatment by M. Koekemoer.

Corynephorus fasciculatus Boiss. & Reut.

Fig. 51. Pl. 46.

Annual; culms solitary or loosely tufted; 200–550 mm tall. Leaf blades 50–120 mm long; 1–2 mm wide. Spikelets about 3 mm long. Hairs at the base of the floret not longer than 1/4 the lemma length; lemma awn basal, usually about as long as the glumes, divided into a lower dark-coloured column and a clavate upper limb, with a ring of fleshy hairs at the junction.

Flowering October to November. Sandy soils in disturbed places. Rare. Naturalized from Europe. Biome: Fynbos. Portugal to the western Mediterranean. Similar to the European species, *C. divaricatus*, which has larger spikelets, the awn distinctly shorter than the glumes and longer hairs at the base of the floret.

Description: Tutin 1980 (5: 231). Voucher: Van Rensburg 139. PRECIS Code 9901880-00100.



Craspedorhachis Benth.

Perennial; often stoloniferous. Culms to 1000 mm high; herbaceous. Ligule a fringed membrane to a fringe of hairs.

Inflorescence of spike-like main branches (several slender spikes, usually on a long axis); digitate or subdigitate, or non-digitate; espatheate. Spikelet-bearing axes spikes; disarticulating (in *C. africana*, the peduncle bears a cupular disarticulation zone at the point of origin of the spikes, which seem to fall together), or persistent (?); falling entire.

Spikelets solitary; biseriate; 3 mm long; compressed dorsiventrally; disarticulating above the glumes. Glumes two; more or less equal (long); awnless; very dissimilar (both long, membranous, the lower asymmetrically 1-keeled, the upper flat-backed, infolded with two keels). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); without a germination flap; 3 nerved; awnless to mucronate. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (c. 1 mm); obovoid; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C_4 ; XyMS+. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chloridoideae *sensu lato*. 5–6 species. Tropical Africa, North and South America. Mesophytic to xerophytic; in open habitats (sandy savanna); glycophytic. Namibia and Botswana. 2 indigenous species.

References. 1. Launert. 1970. FSWA. 2. Clayton & Renvoize. 1986. Gen. Gram.

Species treatment by L. Smook.

1(0). Lemma and palea glabrous *C. rhodesiana*
Lemma and palea with long hairs *C. africana*

Craspedorhachis africana Benth.

Pl. 47.

Perennial; shortly rhizomatous and tufted (densely, erect); to 1200 mm tall. Leaf blades to 200 mm long; to 5.5 mm wide. Spikelets 3–4 mm long. Racemes generally shorter than 90 mm; lemma and palea with long hairs.

Flowering January to April. In sandy soils. Rare (in southern Africa). Biome: Savanna. Zimbabwe, Mozambique, Zambia, Madagascar. Closely related to *C. rhodesiana*, which has short spikelets and glabrous lemmas.

Description: Chippindall & Crook 1976 (209). Voucher: Story 6452 (in K). PRECIS code 9903090–00050.



Fig. 52. *Craspedorhachis rhodesiana*

Craspedorhachis rhodesiana Rendle

Fig. 52.

Perennial; shortly rhizomatous and tufted (densely and erect); to 1200 mm tall. Leaf blades to 200 mm long; to 2.5 mm wide. Spikelets 2.5–3.2 mm long. Racemes generally longer than 90 mm; lemma and palea glabrous.

Flowering December, February and March. Sandy soils or



sandy loam along pan edges, in and along dry river beds and on sand dunes. Infrequent. Biome: Savanna. Angola, Zimbabwe, Mozambique, Zambia. Closely related to *C. africana*, which has slightly larger spikelets and lemmas with long hairs.

Description: Chippindall & Crook 1976 (209), Launert 1970 (160:49). Voucher: Wild & Drummond 7043. PRECIS code 9903090-00100.

Ctenium Panzer

Aplocera Raf., *Campulosa* Desv., *Campulosus* Desv., *Monathera* Raf., *Monocera* Elliott, *Triatherus* Raf.

Perennial (rarely annual); caespitose (densely). Culms 400–1000 mm high; herbaceous. Leaf blades linear; flat, or rolled (convolute). Ligule a fringed membrane (very short). Plants bisexual, with bisexual spikelets. The spikelets all alike in sexuality.

Inflorescence a single spike, or of spike-like main branches; spikes pectinate, usually curved; non-digitate, or digitate or subdigitate; espatheate. Spikelet-bearing axes spikes; persistent.

Spikelets solitary; biseriate (along the midrib of the rachis); 4–9 mm long; adaxial; compressed laterally; disarticulating above the glumes; not disarticulating between the florets. Glumes present; two; very unequal; awned (G2 shortly awn-tipped, and with a spreading awn from the middle of its back); very dissimilar (G2 larger, firmer, awned). Incomplete florets both distal and proximal to the female-fertile florets; distal incomplete florets merely underdeveloped (male or barren); proximal incomplete florets 2; male, or sterile. The proximal lemmas awned (from just below tip).

Female-fertile florets 1. Lemmas less firm than the glumes (i.e., than G2 — membranous); 3 nerved; entire; awned. Awns 1; median; dorsal; non-geniculate; about as long as the body of the lemma to much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3 (2 in male florets). Ovary glabrous. Fruit ellipsoid; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR cell chloroplasts centripetal.

*Cytology, classification, distribution. Chromosome base number, $x = 9$. Chloridoideae; Chlorideae *sensu lato*. 20 species. Tropical and subtropical America and Africa. In open habitats (savanna). Transvaal, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.*

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Ctenium concinnum Nees

Sickle grass.

Wiry perennial; tufted; 400–700 mm tall. Leaf blades 100–300 mm long; 2–5 mm wide. Spikelets 5–7 mm long. Inflorescence a one-sided spike, 50–170 mm long, sickle-shaped to corkscrew-like at maturity; upper glume tubercled; lemmas awned from below apex on nerves, with a spreading awn on the back; female-fertile lemma 4.0–4.5 mm long; awns 4.5–5.5 mm long.

Flowering December to April. Open veld on sandy or sometimes moist soils. Locally common. Biome: Savanna and Grassland. To central tropical Africa.



Fig. 53. Pl. 48.



Fig. 53. *Ctenium concinnum*

Description: Stapf 1898–1900 (638), Chippindall 1955 (192), Clayton et al. 1970–1982 (325). Illustration: Chippindall 1955 (fig. 167). Voucher: Du Toit 2374. PRECIS code 9902990-00100.

Cymbopogon Spreng.

Cymbantheria Anderss., *Gymnantheria* Schweinf.

Perennial (rarely annual); caespitose. Culms 150–3000 mm high; herbaceous; usually unbranched above. *The shoots aromatic.* Leaf blades linear (from broadly so, to filiform); flat, or folded. *Ligule an unfringed membrane to a fringed membrane.* Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (the pedicellate spikelets not depressed abaxially, awnless); in both homogamous and heterogamous combinations (lowermost pair of lowest raceme, or of each raceme, homogamous and imperfect).

Inflorescence paniculate (decompound, leafy); spatheate; a complex of 'partial inflorescences' and intervening foliar organs. Spikelet-bearing axes 'racemes' (short, spikelike, each pair with a spatheole); paired (connate at base, often widely spreading or deflexed); with very slender rachides; disarticulating at the joints.

Spikelets in pairs (or with a terminal triplet); not secund; consistently in 'long-and-short' combinations; these

pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only (usually), or sterile; never depressed or canaliculate on the back; only L1 present, hyaline, 2-nerved, its floret usually male but occasionally sterile or suppressed. Female-fertile spikelets 3–7 mm long; compressed laterally, or not noticeably compressed, or compressed dorsiventrally; falling with the glumes. Glumes two; more or less equal; awnless; very dissimilar (lower bicarinate, upper naviculate). *Proximal incomplete florets 1; epaleate; sterile.*

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline to firm-stipitate beneath the awn); incised (bifid or apically bilobed); awnless, or awned. Awns when present 1; from the sinus; geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea absent. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$, or 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. About 40 species. Tropical and subtropical Africa and Asia, Australia. Mesophytic to xerophytic; in open habitats (savanna); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 6 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

The southern African species are greatly in need of revision, especially in relation to the tropical African species.

Species treatment by G.E. Gibbs Russell.



Fig. 54. *Cymbopogon excavatus*

- 1(0). Leaf blades rounded to cordate at base; lower glume of sessile spikelet with a deep narrow median groove in the lower half, appearing as a rib inside; sessile spikelets 3.5–5.0 mm long; raceme bases often much swollen; lowest node of old culms exposed, not clothed by leaf sheaths **C. excavatus**
Leaf blades parallel-sided at base; lower glume of sessile spikelet deeply concave to flat on back; sessile spikelets (4.5–)5.0–6.0 mm long; raceme bases not swollen; lowest node of culms clothed by leaf sheaths 2
- 2(1). Lower glume of sessile spikelet wingless or with a narrow wing (0.1–0.3 mm wide), back usually deeply concave (rarely only shallowly concave); leaf blades 2–4 mm across, usually folded and appearing setaceous **C. plurinodis**
Lower glume of sessile spikelet with a wing 0.3–0.7 mm wide, back shallowly concave to flat; leaf blades of various widths 3
- 3(2). Ligules 5–12 mm long, usually acutely pointed and papery; leaf blades to 2 mm across, usually folded and appearing setaceous **C. dieterlenii**
Ligules to 10 mm long, usually truncate or rounded and firm-textured; leaf blades (2–)3 mm or more across, usually flat 4
- 4(3). Culms robust, 1200–2400 mm tall; leaf blades 500–700 mm long, 5–10 mm across; racemes appearing glabrous because pedicels are hairy only along the sides (rarely appearing hairy in specimens from Natal sea dunes) **C. validus**
Culms slender, 450–1200 mm tall; leaf blades 300–500 mm long, 3–6 mm across; racemes hairy or nearly glabrous 5
- 5(4). Racemes appearing very hairy, rachises and pedicels with long hairs on the sides and backs **C. marginatus**
Racemes appearing nearly glabrous, rachises and pedicels with hairs only along sides, backs glabrous **C. prolixus**

Cymbopogon dieterlenii Stapf ex Phill.

Perennial; tufted; 450–850 mm tall. Leaf blades 300–500 mm long; setaceous or to 2 mm wide. Spikelets 5–6 mm long (sessile and pedicellate). Ligule 5–12 mm long, papery, pointed; lower glume of sessile spikelets winged, flattish.



Flowering November to April.

Open veld and rocky hillsides. Infrequent. Biome: Savanna and Grassland. Southern Africa. In habit similar to *C. plurinodis*, which has short ligules, broader blades and the lower glume of the sessile spikelet is wingless and deeply grooved.

Description: Chippindall 1955 (508). Voucher: Dieterlen 390B. PRECIS code 9900720–00100.

Cymbopogon excavatus (Hochst.) Stapf ex Burtt Davy Fig. 54.

Common turpentine grass, lemoengras, buchugas.

Perennial; tussocky; to 1500 mm tall. Leaf blades 50–300 mm long; to 14 mm wide. Spikelets (sessile) 3.5–5.0 mm long (pedicellate slightly shorter). Leaf blades rounded at base; lowest culm nodes exposed; lower glume of sessile spikelets with a deep narrow groove.



Flowering mostly November to May. Open veld and hillsides. Very common. Biome: Savanna and Grassland. Southern Africa. Domestic use (thatching). Our species is here retained as separate from the closely-related tropical *C. caesiis*, pending a generic revision. *C. giganteus*, another tropical species which is similar to *C. excavatus* but larger in all parts, may possibly occur in the extreme north. *Diheteropogon amplexens* has similar leaf blades but it is not aromatic and lacks swollen raceme bases.

Description: Chippindall 1955 (506), Clayton et al. 1970–1982 (761). Voucher: De Winter & Codd 467. PRECIS code 9900720–00200.

Cymbopogon marginatus (Steud.) Stapf ex Burtt Davy Pl. 49.

Motwortelterpentyngas, muskusgras.

Perennial; densely tufted; 300–800 mm tall. Leaf blades 150–350 mm long; 2–5 mm wide. Spikelets 5–6.5 mm long (sessile and pedicellate). Racemes conspicuously hairy, lower glume of sessile spikelets winged, flattish.



Flowering July to June. Rocky hillsides. Common. Biome: Fynbos and Nama-Karoo. Endemic. This is the 'winter rainfall' species. It can be distinguished from wide-bladed forms of *C. plurinodis* by the concave and wingless lower glume of the sessile spikelet in that species. However, specimens from several localities in the southwestern Cape appear to be intermediate.

Description: Chippindall 1955 (506). Voucher: Taylor 3197. PRECIS code 9900720–00300.

Cymbopogon plurinodis (Stapf) Stapf ex Burtt Davy

Bitter turpentine grass.

Perennial; tufted; 300–1000 mm tall. Leaf blades 150–300 mm long; 2–4 mm wide (often folded and appearing setaceous). Spikelets (sessile) 5–6 mm long (pedicellate slightly shorter). Lower glume of sessile spikelets



deeply concave, usually wingless or with a narrow wing.

Flowering October to May. Grassveld. Very common. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. Southern and eastern Africa. Our species is retained as separate from the tropical *C. pospischilii* which has longer racemes.

Description: Chippindall 1955 (508), Clayton et al. 1970–1982 (765). Illustration: Chippindall 1955 (fig. 407). Voucher: Smith 4091. PRECIS code 9900720–00400.

Cymbopogon prolixus (Stapf) Phill.

Tamboekiegas.

Perennial; tufted; 900–1200 mm tall. Leaf blades 300–500 mm long; 3–6 mm wide. Spikelets (sessile) 5–6 mm long (pedicellate equalling it or slightly smaller). Racemes nearly glabrous, lower glume of sessile spikelets winged, flattish.



Flowering October to April. Rocky hillsides. Common. Biome: Savanna and Grassland. Endemic. In its habit this species appears intermediate between *C. plurinodis*, which is distinguished by the concave and wingless lower glume of the sessile spikelet, and *C. validus*, which is larger and very robust.

Description: Chippindall 1955 (507). Voucher: Smith 1315. PRECIS code 9900720–00500.

Cymbopogon validus (Stapf) Stapf ex Burtt Davy

(=*C. afronardus* Stapf) 2.

Reuse terpentyngras, giant turpentine grass.

Robust perennial; tufted; 1200–2400 mm tall. Leaf blades 500–700 mm long; 5–10 mm wide. Spikelets (sessile) 4.5–6.0 mm long (pedicellate slightly shorter). Racemes nearly glabrous; lower glume of sessile spikelets winged, flattish.



Flowering July to June (but usually in autumn). Rocky hillsides and scrub vegetation, often in damp places. Common. Biome: Savanna and Grassland. Southern Africa. Probably to be included with the tropical *C. nardus*, but kept separate pending a generic revision.

Description: Chippindall 1955 (507), Clayton et al. 1970–1982 (764). Illustration: Chippindall 1955 (fig. 406). Voucher: Moll 1665. PRECIS code 9900720–00600.

Cynodon Rich.

Capriola Adans., *Dactylon* Vill., *Fibichia* Koel.

Perennial; long-rhizomatous and long-stoloniferous (often sward-forming). Culms 40–600(–1000) mm high; herbaceous. Leaf blades linear; flat, or folded. Ligule a fringed membrane (very short), or a fringe of hairs.

Inflorescence of spike-like main branches; digitate or subdigitate (sometimes in two or more closely spaced whorls); espathate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; 1.7–3 mm long; compressed laterally; disarticulating above the glumes (or between them). Hairy callus absent. Glumes two; more or less equal; awnless; similar (narrow, lanceolate). All florets normally female-fertile, or distal incomplete florets also present; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas 1–4 nerved; membranous; entire; awnless. Palea present; relatively long. Lodicules fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; ellipsoid; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C₄;

NAD-ME (2 species); XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts elongated; with well developed grana; centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 9$ and 10. Chloridoideae; Chlorideae *sensu lato*. 10 species. Tropical and subtropical. Mesophytic, or xerophytic; in open habitats; maritime-arenicolous, halophytic, and glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (6), naturalized species (2).

Intergeneric hybrids with *Chloris* (*X Cynochloris* Clifford & Everist: several species involved).

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Keel of lemma winged; rachilla not produced; glumes usually shorter than half the spikelet length . . . 2
 - Keel of lemma not winged; rachilla usually produced; glumes usually longer than half the spikelet length . . . 3
- 2(1). Leaf blades densely hairy; spikelets 2.0–2.5 mm long, broadly ovate . . . *C. hirsutus*
 - Leaf blades glabrous or very sparsely hairy; spikelets 2.5–3.0 mm long, narrowly ovate . . . *C. incompletus*
- 3(1). Spikes 2 or 3 (very rarely 1 or 4); plants stoloniferous, mat-forming and seldom taller than 150 mm . . . 4
 - Spikes 4–20; plants rhizomatous and/or stoloniferous, sometimes mat-forming, usually 100–1000 mm tall . . . 6
- 4(3). Leaves sparsely or densely hairy; spikes most often 3, erect or spreading . . . *C. bradleyi*
 - Leaves glabrous; spikes most often 2, ascending when young and often reflexed at maturity . . . 5
- 5(4). Rachilla not produced; culms firm; leaves rigid, more than 1.5 mm wide; spikes not reflexed at maturity . . . *C. polevansii*
 - Rachilla produced and often longer than the lower glume; culms delicate; leaves very fine, less than 1.5 mm wide; spikes reflexed at maturity . . . *C. transvaalensis*
- 6(3). Plants rhizomatous and stoloniferous, up to 400 mm tall; spikes usually 4 or 5 (occasionally 3 or up to 6), in a single whorl . . . *C. dactylon*
 - Plants stoloniferous, 300–1000 mm tall; spikes 5–20 in 1–5 whorls . . . 7
- 7(6). Keel of lemma glabrous or with a few solitary hairs; spikes usually stiff and tardily spreading; plants robust, often woody, coarse, 400–1000 mm tall . . . *C. aethiopicus*
 - Keel of lemma very densely pubescent; spikes usually slender to flexuous and spreading; plants fairly slender to robust, not woody, usually soft, 300–600 mm tall . . . *C. nlemfuensis*

Cynodon aethiopicus Clayton & Harlan

Star grass, reuse kweekgras.

Robust perennial; stoloniferous (often woody and coarse); 350–900 mm tall. Leaf blades 30–250 mm long; 3–7 mm wide. Spikelets 2.5–3.0 mm long. Racemes stiff, purple-pigmented, in multiple whorls; keel of lemma not winged, glabrous or with a few single hairs.

Flowering January to June. Rich soils, particularly old cattle kraals and abandoned cultivation, also at moist streamsides. Infrequent. Naturalized from tropical Africa. Biome: Savanna. Tropical Africa. Weed, or erosion control



Fig. 55. *Cynodon dactylon*

(experimental plantings on roadsides). Similar to *C. nlemfuensis*, which is smaller and less robust and has the lemma keel very densely pubescent.

Description: Clayton et al. 1970–1982 (319). Illustration: Clayton et al. 1970–1982 (fig. 89). Voucher: Smook 4140. PRECIS code 9902960-00100.

Cynodon bradleyi Stent

Bradley grass.

Perennial; stoloniferous; 50–100(–300) mm tall. Leaf blades 10–35 mm long; to 2.5 mm wide. Spikelets 2–3 mm long. Leaves densely or sparsely hairy; spikes usually three; rachilla sometimes produced; lemma keel not winged.

Flowering December to March. Fertile, well-drained soils. Infrequent. Biome: Grassland. Endemic. Ornamental



(useful lawn grass). Very similar to *C. hirsutus*, which has a wing on the lemma keel.

Description: Chippindall 1955 (202). Voucher: De Winter 382. PRECIS code 9902960-00200.

Cynodon dactylon (L.) Pers.

Fig. 3. Fig. 8. Fig. 55. Pl. 50.

Couch grass, kweekgras.

Sward-forming perennial; rhizomatous and stoloniferous; 50–350 mm tall. Leaf blades 10–120 mm long; 2–4 mm wide. Spikelets 2.0–2.5 mm long. Racemes (3–)4–5(–6), in a single whorl; lemma keel wingless; upper glume 1/2–3/4 the spikelet length; rachilla produced.

Flowering September to May. In most soils along roadsides and overgrazed, trampled areas. Locally dominant. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Desert. Worldwide in warm and temperate regions. Food and drink (leaves rich in Vitamin C), or pasture (certain strains), or erosion control (hardy pioneer), or ornamental (planted as lawn in gardens or sports fields), or traditional medicine (for heartburn, wounds, indigestion or as a blood purifier), or chemicals (cynodin and tritacin), or weed (in cultivated lands, and a host for many fungi and viruses). This species has been reported as a weed in more than 80 countries and because of the rhizome that can be up to 1000 mm deep it is difficult to eradicate. It is, however, also one of our most valuable grasses because it protects the soil and provides some grazing in areas that suffer from overstocking.

Description: Holm et al. 1977 *The Worlds Worst Weeds* (25), Stapf 1898–1900 (634), Hitchcock & Chase 1950 (483), Chippindall 1955 (200), Clayton et al. 1970–1982 (318). Illustration: Chippindall 1955 (fig. 175), Hitchcock & Chase 1950 (fig. 1031). Voucher: De Winter & Hardy 8110, Brueckner 38, Smook 4751. PRECIS code 9902960-00300.

Cynodon hirsutus Stent

Red quick grass, Transvaal-kweek.

Perennial; stoloniferous; 50–250 mm tall. Leaf blades 15–30 mm long; 2–4 mm wide. Spikelets 2.0–2.5 mm long. Leaf blades hairy; spikelets broadly ovate; glumes more than 1/2 the spikelet length; lemma keel winged; rachilla not produced.

Flowering October to April. Well-drained loam soils. Common. Biome: Savanna and Grassland. Endemic. Erosion control, or traditional medicine (for indigestion and as blood purifier). Very similar to *C. bradleyi*, which lacks a wing on the lemma keel, and *C. incompletus*, which has less hairy leaves and shorter glumes.

Description: Chippindall 1955 (202). Illustration: Chippindall 1955 (fig. 177). Voucher: Potts 3720, Smook & Gibbs Russell 2467. PRECIS code 9902960-00400.

Cynodon incompletus Nees

Karoo quick grass, soet-kweek.

Perennial; stoloniferous; 50–300 mm tall. Leaf blades 30–60 mm long; 2–3 mm wide. Spikelets 2.5–3.0 mm long. Leaf blades glabrous or sparsely hairy; spikelets narrowly ovate; glumes

less than 1/2 the spikelet length; lemma keel winged; rachilla not produced.

Flowering November to May. Sandy loam to turf soils. Common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Australia and Argentina (probably a cultivated pasture). Close to *C. hirsutus*, which has more hairy leaves and longer glumes.

Description: Stapf 1898–1900 (635), Chippindall 1955 (203). Illustration: Chippindall 1955 (fig. 178). Voucher: Acocks 8479. PRECIS code 9902960-00500.

Cynodon nlemfuensis Vanderyst

* Star grass, reuse kweekgras.

Perennial; stoloniferous (stolons stout and woody, plants otherwise fairly soft); 200–600 mm tall. Leaf blades 50–160 mm long; 2–6 mm wide. Spikelets 2–3 mm long. Spikes usually slender, flexuous and spreading; lemma very densely, silky pubescent, keel not winged.

Flowering January to March. In disturbed areas such as old lands, cattle paddocks and road verges, also moist streambanks and weedy places. Infrequent. Naturalized from Kenya. Biome: Savanna. Tropical Africa. Very similar to *C. dactylon* which has rhizomes, and *C. aethiopicus*, which is larger and more robust and has the lemma keel glabrous or with a few single hairs. Some specimens have previously been wrongly identified as *C. plectostachyus* (K. Schum.) Pilg.

Description: Clayton et al. 1970–1982 (319). Voucher: Scheepers 148. PRECIS code 9902960-00550.

Cynodon polevansii Stent

Compact perennial; rhizomatous; 50–120 mm tall. Leaf blades 10–20 mm long; about 2 mm wide. Spikelets 2.7–3.5 mm long. Leaves rigid; spikes 2, not reflexed; rachilla not produced.

Flowering December. Moist areas. Rare. Biome: Grassland. Endemic. The status of this species is very uncertain. Apart from the type specimen there are no other records at PRE. De Wet (1971) *Jl S. Afr. Bot.* 37,1 (53) regards this as a variety of *C. dactylon*.

Description: Chippindall 1955 (202). Voucher: Pole Evans 334 (type). PRECIS code 9902960-00650.

Cynodon transvaalensis Burtt Davy

Transvaal quick grass.

Perennial; rhizomatous; 50–300 mm tall. Leaf blades 1.0–1.5 mm wide. Spikelets 2.0–2.5 mm long. Leaf blades involute and filiform; spikes usually 2, reflexed at maturity; rachilla produced and often longer than the lower glume.

Flowering November to May. Roadsides and weedy places. Infrequent. Biome: Fynbos and Grassland. Northern Africa, cultivated in Zimbabwe. Weed and ornamental (lawns). Delicate fine leaves, a long rachilla and spikes that are reflexed at maturity distinguish it from other *Cynodon* species.

Description: Chippindall 1955 (202), Clayton et al. 1970–1982 (317). Voucher: Smook 4747, Muller 1340. PRECIS code 9902960-00700.

Cynosurus L. *Falonia* Adans.

Annual, or perennial; caespitose. Culms 100–900 mm high; herbaceous; unbranched above. Sheath margins free. Leaf blades linear; flat. *Ligule an unfripped membrane. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (fertile spikelets mixed with and more or less concealed by sterile ones consisting of rigid, lanceolate, awned glumes and lemmas).*

Inflorescence paniculate; contracted; espatheate. Spikelet-bearing axes persistent.

Female-fertile spikelets 2.8–10 mm long; compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; decidedly shorter than the adjacent lemmas, or long relative to the adjacent lemmas; awnless; similar (narrow, thin). *All florets female-fertile, or distal incomplete florets also present; proximal incomplete florets absent.*

Female-fertile florets (1–)2–5. Lemmas similar in texture to the glumes to decidedly firmer than the glumes; 5 nerved; entire, or incised; awned. Awns 1; median; from the sinus, or apical; non-geniculate; much shorter than the body of the lemma, to much longer than the body of the

lemma. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short, or long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Poeae. 8 species. Europe, western Asia, North and South Africa. Mesophytic, or xerophytic; in open habitats (meadows, disturbed ground). Orange Free State and Cape Province. 1 naturalized species (possibly 1 indigenous species).

References. 1. Chippindall. 1955. Gr. & Past. 2. Linder. 1986. *Bothalia* 16: 61. 3. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.

- 1(0). Glumes and lemmas of sterile spikelets produced into awns that are purple at the base and pale above; awns 15–20 mm long; anthers 0.4–0.6 mm long; plants to 200 mm tall; lemmas 3.5–4.0 mm long; fertile spikelets 1-flowered **C. coloratus**
Glumes and lemmas of sterile spikelets produced into pale awns; awns to 15 mm long; anthers 3–4 mm long; plants to 600 mm tall; lemmas 5–7 mm long; fertile spikelets 2–3-flowered **C. echinatus**

Cynosurus coloratus Lehm. ex Nees

Pl. 51.

Annual; loosely tufted; 50–200 mm tall. Leaf blades 10–50 mm long; 2–3 mm wide. Spikelets 10–25 mm long. Female-fertile spikelets 1-flowered; glumes and lemmas of sterile spikelets produced into awns which are purple at the base and pale above, 15–20 mm long; glumes 4–7 mm long; lemmas 3.5–4.0 mm long; anthers 0.4–0.6 mm long.

Flowering March to April. In rocky areas, usually calcareous soils. Rare. Biome: Fynbos. Mediterranean region. Although the type specimen was collected in South Africa, this species has a very doubtful and unsure status. A deeper investigation of more material is needed before it can be decided that both the *Cynosurus* species are represented in South Africa.

Description: Bor 1985 (1725), Linder (31). Voucher: Leistner 275. PRECIS code 9903730–00050.

Cynosurus echinatus L.

Fig. 56.

Dogstail.

Annual; tufted (culms erect or decumbent at the base); 200–600 mm tall. Leaf blades 50–150 mm long; 3–10 mm wide. Spikelets 7–20 mm long. Female-fertile spikelets 2–3-flowered; glumes and lemmas of sterile spikelets produced into pale awns up to 15 mm long; glumes 7–12 mm long; lemmas 5–7 mm long; anthers 3–4 mm long.

Flowering July to January. On rocky, well-drained soils and disturbed places such as roadsides, often in the shade. Infrequent. Naturalized from Europe. Biome: Fynbos and Nama-Karoo. Atlantic islands and Mediterranean region eastwards to India. Weed.

Description: Bor 1985 (1726), Chippindall & Crook 1976 (204), Linder (30), Stapf 1898–1900 (690), Chippindall 1955 (61). Illustration: Chippindall 1955 (fig. 33). Voucher: Crook 2318. PRECIS code 9903730–00100.

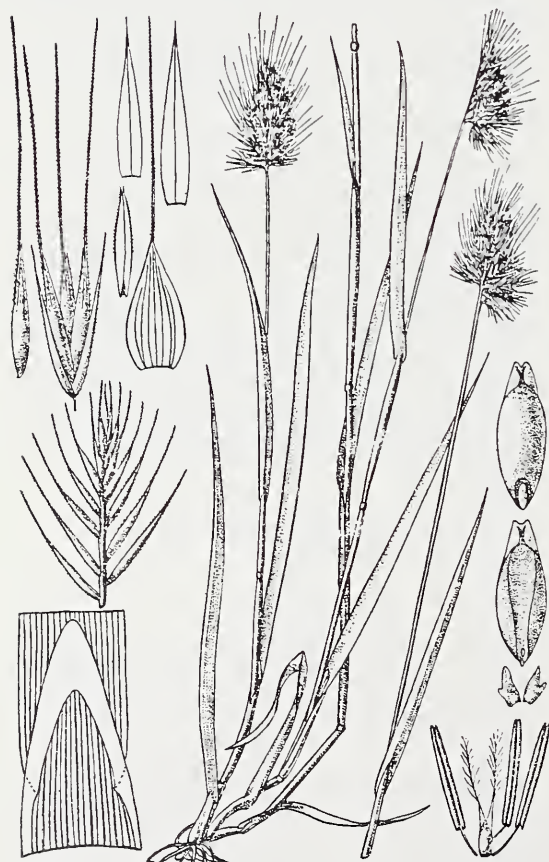


Fig. 56. *Cynosurus echinatus*



Dactylis L.

Amamixis Adans., *Trachypoa* Bub.

Perennial; caespitose (with short, oblique rhizomes and/or stolons). Culms 150–2000 mm high; herbaceous; unbranched above. *Sheath margins joined (to halfway, at least in the upper leaves)*. Leaf blades linear to linear-lanceolate; flat, or rolled (involute). *Ligule an unfringed membrane*.

Inflorescence paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets secund (in dense, one-sided clusters terminating the panicle branches); 4–8 mm long; compressed laterally; disarticulating above the glumes. *Glumes* two; relatively large; very unequal, or more or less equal; markedly shorter than the spikelets to about equalling the spikelets; awned to awnless; *carinate*; similar (membranous, somewhat curved). Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.



Fig. 57.
Dactylis glomerata

Female-fertile florets 2–5. Lemmas decidedly firmer than the glumes; 5 nerved; entire; awned. Awns 1; median; dorsal, or apical; non-geniculate; much shorter than the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Poaeae. 1 species (or up to 5, by recognition of minor segregates). Temperate Eurasia. Mesophytic; in shade and in open habitats (meadows, woodlands and disturbed ground, in moist to dry places). Transvaal, Orange Free State, Natal, and Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.

Dactylis glomerata L.

Cocksfoot, orchard grass.

Fig. 57. Pl. 52.



Perennial; densely and coarsely tufted, or rhizomatous (rhizome oblique); 150–800(–1400) mm tall. Leaf blades 100–450 mm long; 2–14 mm wide. Spikelets 5–9 mm long. Leaf blades folded at first, pilose on upper surface, glabrous, shining and smooth below; ligule membranous, 2–10 mm long; panicle 50–300 mm long, racemes closely spaced, lowest usually solitary, remote and bare at the base; spikelets 3–5(–7)-flowered, laterally compressed; glumes and lemmas strongly keeled, keels finely or coarsely ciliate, tips acuminate, mucronate or awned, awn to 1.5 mm long.

Flowering July, August and November to February. Mostly in cultivation but also in other disturbed places like roadsides. Infrequent. Naturalized from Europe. Biome: Fynbos and Grassland. Introduced to most temperate countries. Used to a limited extent as winter pasture.

Description: Linder (55), Stapf 1898–1900 (696), Hitchcock & Chase 1950 (184), Chippindall 1955 (49), Clayton et al. 1970–1982 (43). Illustration: Chippindall 1955 (fig. 18), Clayton et al. 1970–1982 (fig. 16), Hitchcock & Chase 1950 (fig. 366). Voucher: Du Toit 2543. PRECIS code 9903980–00100.

Dactyloctenium Willd.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent (mostly low, sometimes sward-forming). Culms 50–1000(–1600) mm high; herbaceous. Leaf blades linear to linear-lanceolate; flat, or rolled. Ligule a fringed membrane (narrow), or a fringe of hairs. The spikelets all alike in sexuality (or terminal spikelets sterile).

Inflorescence of spike-like main branches (spikelets almost at right-angles to the rachides); digitate or subdigitate; axes not ending in spikelets (produced into a flattened point); espatheate. Spikelet-bearing axes disarticulating; falling entire.

Female-fertile spikelets biseriate; 2.3–8 mm long; compressed laterally; disarticulating above the glumes; not disarticulating between the florets (rachilla tough). Glumes two (persistent, membranous, laterally compressed); more or less equal; markedly shorter than the spikelets; awned, or awnless (the lower mucronate, the upper awned or mucronate). Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.

Female-fertile florets 3–6. Lemmas 1–3 nerved; entire, or incised; awnless, or mucronate, or awned. Awns when present 1; apical; much shorter than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy. Stamens 3. Ovary glabrous. Fruit small (0.7–1.1 mm long); ellipsoid to subglobose; hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR sheath outlines uneven. PCR sheath extensions present. Maximum number of extension cells 1. PCR cell chloroplasts with well developed grana; centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 10$ and 12. Chloridoideae; Chlorideae *sensu lato*. 13 species. In warm regions. Mesophytic to xerophytic; in open habitats; maritime-arenicolous, halophytic, and glycophytic (sometimes in saline habitats or dunes, mostly in dry sandy soils). Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. 4 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Plants annual, tufted; caryopsis triangular with a truncate to concave apex; spikes 3–9 2
Plants perennial, stoloniferous; caryopsis with a

- rounded to convex apex; spikes 1–3 (rarely to 6) 3
2(1). Anthers 0.3–0.8 mm long; plants not robust, culms geniculate and ascending; glume awn shorter than twice the glume length **D. aegyptium**
Anthers longer than 0.8 mm; plants robust, culms erect; glume awn longer than twice the glume length **D. giganteum**
3(1). Lemma keel smooth, tip acute **D. geminatum**
Lemma keel scabrid, tip awned (awn 0.5–0.7 mm long) **D. australe**

Dactyloctenium aegyptium (L.) Willd.

Crowfoot, duck grass.

Mat-forming annual; tufted (culms geniculately ascending and rooting at the nodes); 70–750 mm tall. Leaf blades 30–250 mm long; 3–8 mm wide. Spikelets 3.5–4.5 mm long. Spikes 4–8, 15–65 mm long; lemma keel scabrid above the middle, ending in a mucro to 1 mm long; anthers 0.3–0.8 mm long; grains broadly triangular, apex truncate to concave.

Flowering January to April. Disturbed areas near water. Common. Biome: Savanna, Grassland, Nama-Karoo, and Desert. Tropical and warm temperate regions worldwide. Food and drink (seed used as food in times of famine), or pasture, or poisonous (bruised young seed used as a fish poison), or traditional medicine (extracted to treat kidney ailment and coughing), or weed (in ricefields and waste ground, host for viruses).

Description: Chippindall & Crook 1976 (5), Fisher & Schweickerdt 1941 Ann. Nat. Mus. 10(1), Stapf 1898–1900 (646), Hitchcock & Chase 1950 (481), Chippindall 1955 (132), Clayton et al. 1970–1982 (252). Illustration: Chippindall 1955 (fig. 104), Hitchcock & Chase 1950 (fig. 1029). Voucher: G.J. du Toit 229. PRECIS code 9903320–00100.

Dactyloctenium australe Steud.

Durban grass, Natal crowfoot.

Perennial; stoloniferous; 130–810 mm tall. Leaf blades 50–270 mm long; 2.0–4.5 mm wide. Spikelets 3–4 mm long. Spikes 2–3, 30–50 mm long; lemma keel scabrid above middle, awn 0.5–0.7 mm long; anthers 1.3–1.7 mm long; grains obovate, apex rounded to convex.

Flowering January to May. Sandy soils on seashores, dunes and along forest roads, often in light shade. Common. Biome: Savanna. Tropical east Africa. Pasture (grazed by stock), or erosion control (good sandbinder), or ornamental (lawns near coast, also grows in shade).

Description: Chippindall 1955 (131), Clayton et al. 1970–1982 (256). Voucher: Smook 5532. PRECIS code 9903320–00200.

Dactyloctenium geminatum Hack.

Mat-forming perennial; rhizomatous and stoloniferous; 350–870 mm tall. Leaf blades 40–250 mm long; 3–6 mm wide. Spikelets 3.0–5.3 mm long. Spikes usually 2(–3), 25–70 mm long; lemma tips acute; anthers 1.1–1.7 mm long; grains obovate, apex rounded to convex.



Fig. 58. *Dactyloctenium giganteum*



Flowering December to March. On sandy soil of alkaline pans and on sand dunes, in swamp forest undergrowth, coastal sandflats and open grassveld. Locally common. Biome: Savanna. Tropical east Africa to Somalia. Erosion control (sand binder).

Description: Chippindall 1955 (131), Clayton et al. 1970–1982 (255). Illustration: Clayton et al. 1970–1982 (fig. 70). Voucher: De Winter & Codd 545. PRECIS code 9903320–00300.

Dactyloctenium giganteum Fisher & Schweick.

Sterretjiegras, gaint crowfoot.

Fig. 58. Pl. 53.

Robust annual; tufted (erect); 480–1140 mm tall. Leaf blades 110–450 mm long; 5–12 mm wide. Spikelets 4.0–6.2 mm long. Spikes 3–9, 35–110 mm long; lemma keels scabrid; awns 0.7–2.0 mm long; grains triangular, apex truncate to concave.

Flowering November to May. Open veld or disturbed areas on river banks or near water, often in shade. Common. Biome: Savanna and Grassland. Tropical east Africa. Weed. The voucher specimen is one of seven duplicates at PRE, which are progeny of the type specimen and were cultivated at the Natal Herbarium.

Description: Chippindall & Crook 1976 (5), Chippindall 1955 (132), Clayton et al. 1970–1982 (251). Voucher: Schweickerdt 1451. PRECIS code 9903320–00400.

Danthoniopsis Stapf

Gazachloa Phipps, *Jacquesfelixia* Phipps, *Petrina* Phipps, *Pleioneura* (C. E. Hubb.) Phipps, *Rattraya* Phipps, *Xerodanthia* Phipps.

Annual (rarely), or perennial; caespitose (sometimes densely so). Culms 250–2000 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear to lanceolate; flat, or rolled (but only slightly so). *Ligule a fringe of hairs. Plants with hermaphrodite florets.*

Inflorescence paniculate; open, or contracted; espathate. Spikelet-bearing axes persistent.

Spikelets in triplets (rarely), or in pairs; not secund; 5–20 mm long; compressed laterally; disarticulating above the glumes. Glumes two; very unequal; awnless, or awned (G2 sometimes aristate); very dissimilar (G1 acute to acuminate, G2 with the tip extended). Proximal incomplete florets 1; paleate, palea fully developed (membranous between the two narrowly winged keels); male.

*Female-fertile florets 1. Lemmas similar in texture to the glumes (to slightly firmer); hairy (the hairs in tufts, or not in tufts; in transverse rows, or not in transverse rows (in Sect. *Pleioneura*)); having the margins tucked in onto the palea; with a clear germination flap (just above the callus, often hidden by hairs); 7–9 nerved; incised; deeply cleft; awned. Awns 1, or 3; median, or median and lateral. The median awn different in form from the laterals (when laterals present); from the sinus (flat, basally twisted); geniculate; much longer than the body of the lemma. Palea present; relatively long (about equalling the lemma). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum long-linear; embryo large.*

Photosynthetic pathway. C_4 . The anatomical organization conventional, or unconventional. Organization of PCR tissue when unconventional *Arundinella* type. XyMS–. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$, or 12 (?). Panicoideae; Panicoideae; Arundinelleae. About 20 species. Africa, Arabia. Mesophytic to xerophytic; in open habitats (savanna woodland and desert

fringes); glycophytic. Namibia, Botswana, Transvaal, Natal, and Cape Province. 6 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1967. Kew Bull. 21: 123. 3. Launert. 1970. FSWA. 4. Phipps. 1972. Bolm. Soc. Broteriana 46: 423. 5. PRE Herbarium practice, following Smook & Gibbs Russell.

Species treatment by H.M. Anderson.



Fig. 59. *Danthoniopsis dinteri*

- 1(0). Plants annual; spikelets 14–20 mm long, with striking colouration, light green variegated with dark purple ***D. dinteri***
 Plants perennial; spikelets less than 14 mm long, without striking colouration, mainly straw-coloured and sometimes tinged with purple 2
- 2(1). Spikelets in lax triads ***D. scopulorum***
 Spikelets in pairs or borne singly 3
- 3(2). Culms profusely branched and many-jointed ***D. ramosa***
 Culms sparingly branched or simple 4
- 4(3). Culms thick-walled and woody; plants growing near water ***D. lignosa***
 Culms brittle or delicate; plants growing amongst rocks 5
- 5(4). Spikelets straw-coloured, 4 mm long; culms delicate ***D. parva***
 Spikelets light sienna brown, 5–9 mm long; culms brittle ***D. pruinosa***

***Danthoniopsis dinteri* (Pilg.) C.E. Hubb.**

Annual; tufted; to 2000 mm tall. Leaf blades 300–600 mm long; 8–15 mm wide. Spikelets 14–20 mm long. Culms robust, unbranched; inflorescence light green variegated with dark purple; spikelets in lax triads, pedicels unequal, usually the 2 lower spikelets are reduced; lower lemma 7-nerved; female-fertile (upper) lemma loosely hairy, lobes acute and 4 mm long, central awn 10–22 mm long.

Flowering February to June. Among rocks and in rock crevices on mountains. Infrequent. Biome: Savanna and Grassland. Zimbabwe, Angola. Natural pasture (grazed when young).

Description: Muller 1984 (118), Chippindall 1955 (286). Illustration: Chippindall 1955 (255). Voucher: Smook 5137. PRECIS code 9901770–00200.

Fig. 59. Pl. 54.



***Danthoniopsis lignosa* C.E. Hubb.**

Robust perennial; tufted; to 2000 mm tall. Leaf blades to 400 mm long; 8 mm wide. Spikelets 4–6 mm long. Culms very thick-walled and woody; inflorescence dense; spikelets in pairs, straw coloured or tinged with light purple; female-fertile (upper) lemma 11-nerved, awns 5 mm long.

Flowering July. River edges in flowing water. Infrequent. Biome: Savanna. Angola.

Description: Hubbard 1949 Kew Bull. 3: (351). Voucher: Leistner, Oliver, Steenkamp & Vorster 313. PRECIS code 9901770–00250.

***Danthoniopsis parva* (J.B. Phipps) Clayton**

Perennial; tufted; 300–600 mm tall. Leaf blades to 50 mm long; 3 mm wide. Spikelets about 4 mm long. Culms delicate; inflorescence straw coloured; spikelets in pairs; upper glume 5-nerved; lower lemma 3-nerved, awns 7–10 mm long.

Flowering January to May.



Rock crevices on cliffs. Infrequent. Biome: Savanna. This species is close to *D. pruinosa*, which has larger spikelets and a 3-nerved upper glume.

Description: Phipps 1964 Kirkia 4 (118). Voucher: Smook 5401. PRECIS code 9901770–00300.

***Danthoniopsis pruinosa* C.E. Hubb.**

Rock powder grass.

Perennial; tufted; 600–1800 mm tall. Leaf blades 100–250 mm long; 5–9 mm wide. Spikelets 5–9 mm long. Rhizome swollen, woody; culms brittle, often branched, with a waxy bloom below the node, nodes occasionally hairy; spikelets light or sienna brown; upper glume and lower lemma 3-nerved; lower lemma with three tufts of white hairs on either side above the middle, lobes acute and 1.0–1.5 mm long, awns 7–12 mm long.

Flowering December to June. Among rock and rock crevices on mountains; granite outcrops and other rock types. Locally common. Biome: Savanna. Zambia, Zimbabwe and southern Malawi.

Description: Chippindall & Crook 1976 (100), Stapf 1898–1900 (286). Illustration: Chippindall 1955 (fig. 256). Voucher: Raal 467. PRECIS code 9901770–00500.



***Danthoniopsis ramosa* (Stapf) Clayton**

(=*Trichopteryx ramosa* Stapf) 5: (=*Loudetia anomala* C.E. Hubb. & Schweick.) 3: (=*Loudetia ramosa* (Stapf) C.E. Hubb.) 2.

Shrub or dwarf shrub; tufted; 450–600 mm tall. Leaf blades to 300 mm long; 3 mm wide. Spikelets about 10 mm long. Culms profusely branched with many joints; spikelets borne singly or in pairs, pale green to straw coloured, usually tinged with purple; lower lemma 5–7-nerved and glabrous; female-fertile (upper) lemma loosely hairy, lobes acute, 2 mm long, awns 8–12 mm long.

Flowering December to June. Among rocks on hills and in ravines. Locally common. Biome: Nama-Karoo. Pasture.

Description: Chippindall 1955 (284). Illustration: Muller 1984 (fig. 59). Voucher: De Winter 2776. PRECIS code 9901770–00700.



***Danthoniopsis scopulorum* (J.B. Phipps) J.B. Phipps**

(=*Gazochloa scopulorum* J.B. Phipps) 4.

Perennial; tufted; 300–400 mm tall. Leaf blades to 200 mm long; filiform or to 2 mm wide. Spikelets about 9 mm long. Spikelets arranged in lax triads, straw coloured; lower lemma 7-nerved, awns 12 mm long.

Flowering June. Growing on rock faces. Infrequent. Biome: Savanna. Similar to the tropical species *D. chimanimaniensis*, which has purple spikelets and lower lemma 5-nerved.

Description: Phipps 1965 Kirkia 5 (229). Voucher: Codd 4314 (the type specimen). PRECIS code 9901770–00750.



Deschampsia P. Beauv.

Airidium Steud., *Aristavena* Albers & Butzin, *Avenella* Parl., *Campella* Link, *Czerniaevia* Ledeb., *Erioblastus* Honda, *Homoiachne* Pilger, *Lerchenfeldia* Schur, *Podinapus* Dulac.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent (but usually caespitose). Culms 80–2000 mm high; herbaceous; unbranched above. Leaf blades linear; flat, or folded, or rolled (convolute). *Ligule an unfringed membrane*.

Inflorescence paniculate; espatheate. Spikelet-bearing axes persistent.

Spikelets not secund; 3–9 mm long; compressed laterally; disarticulating above the glumes. *Rachilla hairy*. *Glumes* two; very unequal (rarely), or more or less equal; markedly shorter than the spikelets to about equalling the spikelets; *long relative to the adjacent lemmas*; awnless; similar (subscarios to membranous, with thin margins). All florets female-fertile, or distal incomplete florets also present; proximal incomplete florets absent.

Female-fertile florets 2–3 (usually 2, rarely only one). *Lemmas* similar in texture to the glumes to decidedly firmer than the glumes; *non-carinate*; 4–7 nerved; entire, or incised (2-lobed, toothed or truncate); awned. Awns 1;

median; dorsal; non-geniculate, or geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large (rarely), or small.

Cytology, classification, distribution. Chromosome base number, $x = 7$ and 13. Pooideae; Poodae; Aveneae. 40 species. North and South temperate, high altitude tropics. Helophytic, or mesophytic; in shade and in open habitats (meadows, upland grasslands and woods). Orange Free State, Lesotho, and Cape Province. 2 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1970. FTEA. 3. Clarke. 1980. Fl. Europ.

Species treatment by T.M. Sokutu.

- 1(0). Ligule deeply lobed, 1–2 mm long; spikelets 5–6 mm long; awn geniculate, well exerted beyond the glumes; lemma apices notched ***D. flexuosa***
Ligule entire, 5.0–11.5 mm long; spikelets 3–4 mm long; awn almost straight, hardly exerted beyond the glumes; lemma apices jagged . . . ***D. caespitosa***

Deschampsia caespitosa (L.) Beauv.

Fig. 60. Pl. 55.

Perennial; tufted (to densely so); 250–850 mm tall. Leaf blades 70–200 mm long; 2–4 mm wide. Spikelets 3–4 mm long. Leaf blades expanded, scabrid, pale green to light brown when dry; ligule entire, 5.0–11.5 mm long; lemma apices deeply notched, truncate, awn almost straight, hardly exerted from the glumes.

Flowering January to March. Typical grassland habitat, usually damp or black nutrient-rich soil. Infrequent. Naturalized from Europe. Biome: Grassland. Northwards through Africa and the Mediterranean to Europe. Easily distinguished from *D. flexuosa* by its jagged lemma apices and leaves that are never filiform.

Description: Hubbard 1954 Grasses (227), Clarke 1980 (5:225), Chippindall 1955 (85), Clayton et al. 1970–1982 (92). Voucher: Hoener 1769, Du Toit 2233. PRECIS code 9901890–00100.

Deschampsia flexuosa (L.) Trin.

Perennial; tufted; 50–500 mm tall. Leaf blades 200–1200 mm long; 0.5–1.5 mm wide. Spikelets 5–6 mm long. Leaf blades convolute, glabrous, dark green; ligule deeply lobed, 1–2 mm long; lemma apices shallowly notched, awns geniculate, well exerted beyond the glumes.

Flowering January to March. Uplands, dry to wet sandy loam soil, 2200–2300 m. Infrequent. Naturalized from Europe. Throughout Africa, America, Europe. It is not always clear whether the awn originates basally or from the lower 1/3 of the lemma. Only a few specimens of this species were available. Based on the descriptions and comments on herbarium sheets, our material represents var. *afromontana* C.E. Hubb.

Description: Hubbard 1954 Grasses (225), Clarke 1980 (5:226), Chippindall 1955 (85), Clayton et al. 1970–1982 (94). Illustration: Chippindall 1955 (fig. 56). Voucher: Esterhuysen 28262. PRECIS code 9901890–00200.



Fig. 60. *Deschampsia caespitosa*

Diandrophloa DeWinter

Sometimes included in *Eragrostis* Wolf.

Annual, or perennial; caespitose. Culms 100–1500 mm high; herbaceous (soft, geniculate or erect); branched above, or unbranched above. Leaf blades linear to linear-lanceolate; flat. *Ligule an unfripped membrane*.

Inflorescence paniculate; open, or contracted; non-digitate (the branches in pseudo-whorls on a central axis); espatheate. Spikelet-bearing axes persistent.



Fig. 61. *Diandrophloa namaquensis*

Spikelets solitary; 1–3.5 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. *Hairy callus absent* ('callus swollen, truncate, glabrous'). Glumes two; very unequal to more or less equal; markedly shorter than the spikelets; awnless; similar (membranous or sub-hyaline, ovate to lanceolate, often green). *Upper glume 1 nerved*. All florets female-fertile, or distal incomplete florets also present, these merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2–14. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (translucent or thinly leathery); 3 nerved; entire, or incised; awnless. Palea present; relatively long. *Lodicules* 2; fleshy; glabrous. Stamens 2. Ovary glabrous. Hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 7 species. Americas, Australia, Asia, Africa. In shade, or in open habitats; glycophytic. Namibia, Botswana, Transvaal, Natal, and Cape Province. 2 indigenous species.

References. 1. De Winter. 1960. Bothalia 7: 387.

Species treatment by M. Koekemoer.

- 1(0). Spikelets 1.0–1.5 mm long, 2–4-flowered; lemmas 0.5–0.6 mm long; inflorescence branches spreading **D. pusilla**
Spikelets 2–3 mm long, 4–8-flowered; lemmas about 1 mm long; inflorescence branches somewhat contracted **D. namaquensis**

Diandrophloa namaquensis (Nees) De Winter

(=*Eragrostis namaquensis*
Nees ex Schrad.) 1.

Fig. 61. Pl. 56.



Annual; tufted; 250–1500 mm tall. Leaf blades 60–300 mm long; 2–6 mm wide. Spikelets 2–3 mm long. Inflorescence branches somewhat contracted, young branches often wavy; spikelets 4–8-flowered, very delicate.

Flowering throughout the year (with peak from March to May). Always near water on sandy or clayey soil. Locally common (moist areas). Biome: Savanna, Grassland, Nama-Karoo, and Desert. Tropical Africa. Distinguished from *Eragrostis* by a membranous ligule and only two stamens per floret.

Description: De Winter 1960 (387), Chippindall 1955 (182), Clayton et al. 1970–1982 (209). Illustration: Chippindall 1955 (fig. 156). Voucher: Smith 1480. PRECIS code 9902852–00100.

Diandrophloa pusilla (Hack.) De Winter

(=*Eragrostis pusilla*
Hack.) 1.



Annual; tufted; 100–420 mm tall. Leaf blades 50–150 mm long; 2–5 mm wide. Spikelets 1.0–1.5 mm long. Inflorescence branches spreading when fully developed, spikelets 2–4-flowered, very delicate.

Flowering March to May. Always near water in sandy or clayey soil, often in the shade. Conservation status not known. Infrequent. Biome: Savanna. Zimbabwe and Angola. Distinguished from *Eragrostis* by a membranous ligule and only two stamens per floret.

Description: De Winter 1960 (387), Chippindall 1955 (182). Illustration: Chippindall 1955 (fig. 157). Voucher: De Winter & Codd 313. PRECIS code 9902852–00200.

Dichanthium Willem.

Diplasanthum Desv., *Lepeocercis* Trin.

Annual (rarely), or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 150–2000 mm high; herbaceous; branched above, or unbranched above. Leaf blades flat. *Ligule an unfringed membrane to a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (the pedicellate spikelets smaller, awnless), or homomorphic; in both homogamous and heterogamous combinations (the lowest pair being imperfect and homogamous).*

Inflorescence of spike-like main branches (many-jointed 'racemes'), or paniculate (rarely; the lower 'racemes' sometimes branched again at the base); digitate or subdigitate (the racemes often almost palmate, towards the culm tips); spatheate, or espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (with many — more than 8 — sessile spikelets); solitary, or paired, or clustered; with very slender rachides; disarticulating at the joints. The pedicels and internodes of the rachis without a longitudinal, translucent furrow. 'Articles' without a basal callus-knob.

Spikelets in pairs (with a terminal triplet); consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite (save at the raceme base, where the spikelet pairs are homogamous). The pedicellate spikelets male-only, or sterile; awnless. Female-fertile spikelets compressed dorsiventrally; falling with the glumes. Glumes two; relatively large; more or less equal; awnless; very dissimilar (lower

bicarinate, upper narrower and naviculate). *Proximal incomplete florets 1; epaleate; sterile.*

Female-fertile florets 1. Lemmas less firm than the glumes (reduced to a hyaline stipe); entire; awned. Awns 1; median; apical; geniculate; much longer than the body of the lemma. Palea present, or absent; when present very reduced. Lodicules 2; fleshy; glabrous. Stamens 1–3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. About 16 species. Old World Tropics. Helophytic to xerophytic; in open habitats (from marshes to subdesert and disturbed ground); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, Cape Province. Indigenous species (1), naturalized species (1).

Intergeneric hybrids with *Bothriochloa*.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

1(0). Culm glabrous below inflorescence, nodes with a ring of spreading hairs; lower glume of sessile spikelet to 1.5 mm across **D. annulatum**

Culm velvety below inflorescence, nodes glabrous to short-woolly; lower glume of sessile spikelet to 2.5 mm across **D. aristatum**

***Dichanthium annulatum* (Forssk.) Stapf var. *papillosum* (A. Rich.) De Wet & Harlan**

Fig. 62. Pl. 57.

(= *D. nodosum* sensu Acocks, non Willemet) 1; (= *D. papillosum* (Hochst.) Stapf) 1.

Blue grama, vlei finger grass.



Perennial; densely tufted; to 1000 mm tall. Leaf blades 30–300 mm long; to 7 mm wide. Spikelets (sessile) 2.5–5.0 mm long; 1.0–1.5 mm wide. Nodes with a ring of spreading hairs; culms glabrous below inflorescence; lower glume of sessile spikelets to 1.5 mm wide.

Flowering July to June (mostly in late summer). Riverbanks and wet places. Common. Biome: Savanna and Nama-Karoo. North to Ethiopia.

Description: Chippindall 1955 (480), Clayton et al. 1970–1982 (725). Illustration: Chippindall 1955 (fig. 394). Voucher: Edwards 3057. PRECIS code 9900640–00050.

***Dichanthium aristatum* (Poir.) C.E. Hubb.**

Perennial; tufted; to 1100 mm tall. Leaf blades 30–250 mm long; 2–7 mm wide. Spikelets (sessile) 3.0–4.5 mm long; to 2.5 mm wide. Nodes glabrous or short-woolly; culms velvety below inflorescence; lower glume of sessile spikelets to 2.5 mm wide.

Flowering October to June. Disturbed and moist places. Infrequent. Naturalized from tropical Asia. Biome: Savanna. Introduced to most tropical areas.

Description: Chippindall 1955 (481), Clayton et al. 1970–1982 (723). Voucher: Mogg 13709. PRECIS code 9900640–00100.



Fig. 62. *Dichanthium annulatum* var. *papillosum*

Digitaria Haller

Acicarpa Raddi, *Digitariella* De Winter, *Elytroblepharum* Steud., *Elytroblepharum* (Steud.) Schlecht., *Eriachne* Phil., *Gramerium* Desv., *Sanguinaria* Bub., *Sanguinella* Gleichen, *Syntherisma* Walt., *Trichachne* Nees, *Valota* Adans.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent (sometimes sward forming). Culms (60–)150–3000 mm high (or more?); herbaceous; branched above, or unbranched above. Leaf blades linear to lanceolate; flat, or folded, or rolled. *Ligule an unfri*nged membrane (usually).

Inflorescence of spike-like main branches; open, or contracted; digitate or subdigitate, or non-digitate; espatheate. Spikelet-bearing axes persistent.



Fig. 63. *Digitaria eriantha*

Spikelets solitary, or in pairs, or in triplets; consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations; *abaxial*; compressed dorsiventrally; falling with the glumes. Glumes one per spikelet, or two; very unequal (lower tiny or suppressed); awnless; very dissimilar. *Proximal incomplete florets* 1; paleate, or epaleate, palea when present reduced; sterile.

Female-fertile florets 1. *Lemmas* similar in texture to the glumes, or decidedly firmer than the glumes; smooth to striate; hairless (no more than minutely striate-papillate); *having the margins lying flat and exposed on the palea*; with a clear germination flap; 1–3 nerved (obscured); entire; awnless (but often apiculate). Palea present; relatively long (about equalling the lemma). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small. Hilum short; embryo large.

Photosynthetic pathway. C₄; NADP-ME (*D. sanguinalis*); XyMS–. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9, 15$, and 17. Panicoideae; Panicoideae; Paniceae. 220 species. Mainly in warm regions. Mesophytic, or xerophytic; mostly in open habitats (diverse habitats, including weedy ground and sandy beaches). Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (35), naturalized species (1).

References. 1. De Winter. 1961. *Bothalia* 7: 467. 2. Kok. 1981. *Bothalia* 13: 435. 3. Clayton & Renvoize. 1982. FTEA. 4. Kok. 1984. SA. J. Bot. 3: 185. 6. Kok. 1978. DSc, Univ. Pretoria. 6. Kok *et al.* 1989. SA. J. Bot. 55: 141. 7. Veldkamp. 1973. *Blumea* 21: 1. 8. Webster. 1987. *Sida* 12: 209.

Species treatment by P.D.F. Kok and H.M. Anderson.

- 1(0). Pedicel tips with stiff white hairs, some overtopping the spikelet ***D. diagonalis* var. *diagonalis***
Pedicel tips with or without stiff hairs, but if present not overtopping the spikelet 2
- 2(1). Internode present between the glumes, or between the glumes and rest of spikelet 3
Internode absent between the glumes, or between the glumes and rest of spikelet 5
- 3(2). Internode present between glumes and rest of spikelet ***D. gymnostachys***
Internode present between lower and upper glume 4
- 4(3). Upper glume longer than 6.0 mm ***D. remotigluma***
Upper glume shorter than 4.5 mm ***D. debilis***
- 5(2). All or the lower racemes arranged in 6 or more whorls ***D. perrottetii***
Racemes arranged digitately, single or irregularly, or if in whorls then these 3 or fewer 6
- 6(5). Racemes without spikelets for the lower third of their length; central axis longer than the racemes ***D. flaccida***
Racemes bearing spikelets along their whole length; central axis shorter than the racemes (except in some specimens of *D. velutina*) 7
- 7(6). Inflorescence a single raceme; female-fertile (upper) lemma not black at maturity ***D. monodactyla***
Inflorescence of two or more racemes (except in some specimens of *D. eylesii*; but then the female-fertile (upper) lemma black at maturity) 8
- 8(7). Spikelet hairs silvery or silky and extending more than 1 mm beyond apex of spikelets into a brush-like point 9
Spikelet hairs if present not silvery or silky, and extending less than 0.5 mm beyond apex of spikelets, not forming a brush-like point 11
- 9(8). Rhizome horizontal to oblique ***D. tricholaenoides***
Rhizome, if present, not horizontal to oblique 10
- 10(9). Plants annual, lower leaf sheaths glabrous or sparsely hairy ***D. gayana***

- Plants perennial, lower leaf sheaths densely hairy **D. brazzae**
- 11(8). Spikelets in threes, if some are paired then the female-fertile (upper) lemma dark brown or black, or paired spikelets alternate with solitary spikelets 12
Spikelets paired or solitary; female-fertile (upper) lemma pale brown, greyish or purple 20
- 12(11). Upper glume as long as the female-fertile (upper) lemma, concealing the lemma which is pallid to dark brown 13
Upper glume shorter and narrower than the female-fertile (upper) lemma, exposing the lemma which is dark brown or black 15
- 13(12). Rachis triquetrous; spikelets longer than 2.0 mm **D. angolensis**
Rachis winged; spikelets shorter than 1.8 mm 14
- 14(13). Upper lemma grey; racemes typically paired **D. longiflora**
Upper lemma dark brown; racemes typically three or more **D. violascens**
- 15(12). Plants perennial 16
Plants annual 18
- 16(15). Spikelets longer than 3.0 mm **D. setifolia**
Spikelets shorter than 2.8 mm 17
- 17(16). Branched rhizome present; racemes 1–3, longer than 100 mm **D. eylesii**
Branched rhizome absent; racemes 3–6, shorter than 90 mm **D. maitlandii**
- 18(15). Nerves of the lower lemma thickened **D. comifera**
Nerves of the lower lemma not thickened 19
- 19(18). Spikelets longer than 2.2 mm; pedicel with a corona of hairs **D. ternata**
Spikelets shorter than 2.0 mm; pedicel without a corona of hairs **D. thouaresiana**
- 20(11). Annuals, not mat-forming; stolons absent but culms sometimes rooting from the lower nodes 21
Perennials or mat-forming annuals; stolons present or absent 25
- 21(20). Nerves of the lower lemma scaberulous 22
Nerves of the lower lemma smooth 23
- 22(21). Lower lemma 2.3–3.1 mm long, shorter to slightly longer than the female-fertile (upper) lemma **D. sanguinalis**
Lower lemma 0.2–0.5 mm long, longer than the female-fertile (upper) lemma **D. acuminatissima**
- 23(21). Racemes scattered on a central axis which is longer than the shortest racemes, but the longer racemes are longer than the axis; racemes delicate and spikelets loosely imbricate **D. velutina**
Racemes digitate, central axis if present not exceeding the length of the shortest racemes; racemes not delicate and spikelets not loosely imbricate 24
- 24(23). Lower glume absent or a minute rim and obscure; spikelet usually less than 2.3 mm long **D. nuda**
Lower glume a distinct triangular scale; spikelet usually more than 2.3 mm long **D. ciliaris**
- 25(20). Lower glume completely clasping the spikelet **D. maniculata**
Lower glume not clasping the spikelet 26
- 26(25). Spikelets glabrous; upper glume as long as the lower lemma, plants mat-forming **D. abyssinica**
Spikelets hairy, or if glabrous then the upper glume shorter than the lower lemma; plants usually tufted, rarely mat-forming 27
- 27(26). Upper glume as long as the lower lemma, concealing the female-fertile (upper) lemma **D. gazensis**
Upper glume shorter than the lower lemma, partly exposing the female-fertile (upper) lemma 28

- 28(27). Inflorescence panicle-like, central axis longer than the racemes **D. rukwae**
Inflorescence digitate, central axis not longer than the racemes 29
- 29(28). Narrowest interspaces on lower lemma adjacent to the central nerve; racemes often adhering to each other by the hairs **D. argyrograpta**
Broadest interspaces on the lower lemma adjacent to the central nerve, or interspaces of similar width; racemes not adhering to each other by the hairs 30
- 30(29). Lamina of the lower leaves reduced; culms mainly branched at the middle nodes **D. polyphylla**
Lamina of the lower leaves not reduced; culms unbranched, or branched mainly at the lower nodes 31
- 31(30). Rhizomes with innovations covered by hairy cataphylls **D. seriata**
Rhizomes without innovations covered by hairy cataphylls 32
- 32(31). Ligule longer than 4.0 mm; lower leaf sheaths rusty brown **D. natalensis**
Ligule shorter than 3.5 mm; lower leaf sheaths not rusty brown 33
- 33(32). Nerves of lower lemma scaberulous **D. milanjanina**
Nerves of lower lemma smooth 34
- 34(33). Plants robust and always erect, densely tufted, usually more than 350 mm tall; culms at base 2.5 mm or more across **D. eriantha**
Plants delicate and often decumbent, loosely tufted, usually less than 350 mm tall; culms at base 2.0 mm or less across 35
- 35(34). Spikelets longer than 3.0 mm **D. diversinervis**
Spikelets shorter than 2.8 mm **D. didactyla**

Digitaria abyssinica (A. Rich.) Stapf

(=*D. scalarum* (Schweinf.) Chiov.) 4; (=*D. vestita* Fig. & De Not. var. *scalarum* (Schweinf.) Henr.) 3.



Abyssinian finger grass.

Perennial; rhizomatous (mat-forming); 200–350 mm tall. Leaf blades 40–70 mm long; 3–6 mm wide. Spikelets 1.8–2.2 mm long; 1 mm wide. Long wiry rhizomes; culms branched at nodes; racemes 3–11, subdigitate, 20–80 mm long; spikelets paired, rarely solitary; upper glume and lower lemma as long as spikelet, glabrous and often tinged with purple; female-fertile (upper) floret light brown, grey and purple.

Flowering November to June. Mainly disturbed ground. Locally common. Biome: Fynbos, Savanna, and Grassland. Tropical Africa. Cultivated pasture and ornamental (lawns), or weed.

Description: Clayton et al. 1970–1982 (641). Illustration: Clayton et al. 1970–1982 (fig. 147). Voucher: Smook 3573. PRECIS code 9900890–00100.

Digitaria acuminatissima Stapf

(=*D. acuminatissima* Stapf subsp. *inermis* Goetghebeur) 4.



Annual; loosely tufted; 600–1200 mm tall. Leaf blades 30–250 mm long; 3–10 mm wide. Spikelets 2.5–4.0 mm long; 1 mm wide. Culms rooting at lower nodes; racemes 4–20, digitate to subdigitate, 70–250 mm long; lower lemma conspicuously

longer than spikelet, 0.2–0.5 mm long, acuminate, scaberulous along nerves.

Flowering February. Riversides and near damp rocks. Infrequent. Biome: Savanna. Tropical Africa.

Description: Clayton et al. 1970–1982 (650). Voucher: De Winter and Giess 7005. PRECIS code 9900890–00150.

Digitaria angolensis Rendle

Annual; loosely tufted; 150–400 mm tall. Leaf blades 40–90 mm long; 4–6 mm wide. Spikelets 2.0–2.5 mm long; 0.8 mm wide. Culms often decumbent; racemes 2–5, digitate or subdigitate, 120–180 mm long; spikelets in clusters of 3; rachis triquetrous; upper glume as long as spikelet; upper glume and lower lemma covered with silver hairs 1 mm long.

Flowering August. Sandy soil. Infrequent. Biome: Savanna. Tropical Africa southwards.

Description: Clayton et al. 1970–1982 (633). Illustration: Kok 1978 (fig. 8.9). Voucher: Smook 1324. PRECIS code 9900890–00250.

Digitaria argyrograpta (Nees) Stapf

Silver finger grass.

Perennial; rhizomatous and tufted; 200–600 mm tall. Leaf blades 40–200 mm long; 1–3 mm wide. Spikelets up to 3 mm long; 0.8 mm wide. Rhizomes knotty, culms profusely branched from lower nodes; racemes usually in pairs 40–100 mm long, often adhering to each other because the hairs on the spikelets become entangled; lower glume 2/3–4/5 as long as spikelet; lower lemma 7-nerved with 3 nerves close together in the middle, thus with narrow interspaces adjacent to central nerve.

Flowering November to March. Wide range of habitats. Common. Biome: Savanna, Grassland, and Nama-Karoo. Mozambique. Natural pasture.

Description: Chippindall 1955 (414). Illustration: Chippindall 1955 (fig. 346). Voucher: Smook 993. PRECIS code 9900890–00400.

Digitaria brazzae (Franch.) Stapf

Brown finger grass.

Perennial; densely tufted; 500–1100 mm tall. Leaf blades 60–100 mm long; 2–4 mm wide. Spikelets 2.8–3.2 mm long; 1 mm wide. Cataphylls and basal sheaths densely covered with silky hairs; racemes 2–4, digitate, 150–200 mm long; spikelets in clusters of 2–4(–5); upper glume 1/2–3/4 as long as spikelet; lower lemma depressed and hyaline beside the midnerve, with hairs 2–4 mm long forming 2 tufts at the base and fringing the upper half of the margin.

Flowering September to April. Grows in grassland, usually sandy soil, often on stony hillsides. Locally common. Biome: Savanna and Grassland. Tropical and subtropical Africa.

Description: Clayton et al. 1970–1982 (627). Illustration: Kok 1978 (fig. 8.16). Voucher: Du Toit 1236. PRECIS code 9900890–00600.



Fig. 64. *Digitaria debilis*

Digitaria ciliaris (Retz.) Koeler

(=*D. adscendens* Henr.) 2;
(=*D. marginata* Link) 4.

Tropical finger grass.

Annual; tufted; 200–550 mm tall. Leaf blades 30–160 mm long; 3–10 mm wide. Spikelets 2.3–3.4 mm long; 1 mm wide. Racemes 3–7, digitate, 40–100 mm long; lower glume a triangular scale up to 0.3 mm long; lower lemma not scaberulous.

Flowering January to April. Mainly disturbed sandy soil.



Locally common. Biome: Savanna, Grassland, and Nama-Karoo. Pan-tropical. Weed.

Description: Chippindall 1955 (399). Illustration: Kok 1978 (fig. 8.23). Voucher: Smook 1982. PRECIS code 9900890-00700.

***Digitaria comifera* Pilg.**

Annual; tufted; 300–800 mm tall. Leaf blades 40–100 mm long; 2–5 mm wide. Spikelets 2.2–2.7 mm long; 1 mm wide. Racemes 2–7, subdigitate, 30–150 mm long; spikelets in clusters of 3–5 on a winged rachis with sharply angular midrib; upper glume $\frac{3}{4}$ as long as spikelet, covered with rows of white clavate hairs; lower lemma glabrous or hairy, midrib prominent because hyaline interspaces allow the dark brown colour of the lower floret to show through.

Flowering February. Open sandy places by roadsides. Infrequent. Biome: Savanna. East Africa.

Description: Clayton et al. 1970–1982 (630). Voucher: De Winter 9125. PRECIS code 9900890-00750.

***Digitaria debilis* (Desf.) Willd.**

Finger grass.

Annual; tufted; 100–500 mm tall. Leaf blades 20–25 mm long; 2–4 mm wide. Spikelets 2.1–3.1 mm long; 1 mm wide. Culms decumbent at base and rooting from the lower nodes; racemes 60–160 mm long, 4–12, subdigitate, on a central axis up to 60 mm long; spikelets solitary or paired; lower and upper glume separated by an internode 0.1–0.3 mm long; upper glume longer than spikelet but less than 4.5 mm long and tip acuminate.

Flowering November to June. Mainly damp places and sandy soil. Locally dominant. Biome: Fynbos and Savanna. Central and north Africa and southern Europe.

Description: Chippindall 1955 (396), Clayton et al. 1970–1982 (637). Illustration: Kok 1978 (fig. 8.4). Voucher: Smook 4183. PRECIS code 9900890-00800.

Digitaria diagonalis* (Nees) Stapf var. *diagonalis

(=*D. trichopodia* Stent) 4;
(=*D. uniglumis* (A. Rich.)
Stapf) 2.

Brown seed finger grass.

Perennial; tufted; 400–1500 mm tall. Leaf blades 90–170 mm long; 2–3 mm wide. Spikelets 1.4–2.4 mm long; 1 mm wide. Culms swollen and bulbous at base; basal leaf sheaths silky-hairy, breaking up into fibres; inflorescence a panicle; spikelets in groups of 3(–6), on unequal pedicels with 10–15 white setae as long as or longer than spikelets; female-fertile (upper) floret bright dark brown or black.

Flowering January to April. Grows in open, usually sourveld grassland, often hillsides and in damp places. Locally dominant. Indigenous. Biome: Savanna and Grassland. Two additional varieties occur in eastern and western Africa. May be confused with *D. eylesii*, which lacks long setae and has racemes in pairs or threes.



Fig. 65. *Digitaria diagonalis* var. *diagonalis*

Description: Chippindall 1955 (419), Clayton et al. 1970–1982 (625). Illustration: Chippindall 1955 (fig. 349), Clayton et al. 1970–1982 (fig. 145). Voucher: Davidse 6759. PRECIS code 9900890-01000.

***Digitaria didactyla* Willd.**

(=*D. swazilandensis* Stent) 4.

Blue couch, Swaziland finger grass.

Perennial; weakly tufted, or stoloniferous (and mat-forming); 150–300 mm tall. Leaf blades 25–50 mm long; 1.0–1.8 mm wide. Spikelets 2.5–2.8 mm long; 0.8 mm wide. Rhizomes knotty; culms may be branched and rooted at lower nodes; racemes 2–4, digitate, 30–65 mm long.

Disturbed sandy soil. Locally common. Madagascar. Biome: Savanna and Grassland. Cultivated worldwide. Ornamental (lawns). Spikelet similar to some forms of *D. eriantha* where the spikelet is 2.2–4.0 mm long.

Description: Veldkamp 1973(44). Voucher: Smook 1986. PRECIS code 9900890–01050.

***Digitaria diversinervis* (Nees) Stapf**

(=*D. albomarginata* Stent) 4;
(=*D. diversinervis* (Nees) Stapf
var. *woodiana* Henr.) 2.

Richmond and Wynberg finger grass.

Perennial; rhizomatous and stoloniferous (and mat-forming); 200–350 mm tall. Leaf blades 20–90 mm long; 3–8 mm wide. Spikelets 3–4 mm long; 1 mm wide. Rhizomes knotty, much branched; racemes 2–5, digitate, 30–77 mm long; lower glume a well developed scale up to 1 mm long; upper glume 1/2–2/3 the length of the spikelet; upper glume and lower lemma glabrous or hairy along margins.

Flowering November to June. Mainly sandy coastal areas. Locally common. Biome: Fynbos, Savanna, and Grassland. Endemic. Ornamental (lawn grass, grows well in shade).

Description: Chippindall 1955 (398). Illustration: Chippindall 1955 (335). Voucher: Smook 1855. PRECIS code 9900890–01200.

***Digitaria eriantha* Steud.**

(=*D. bechuanica* (Stent) Henr.) 2; (= *D. decumbens* Stent) 2; (= *D. dinteri* Henr.) 4; (= *D. eriantha* subsp. *pentzii* (Stent) Kok) 4; (= *D. eriantha* subsp. *stolonifera* (Stapf) Kok) 4; (= *D. eriantha* subsp. *transvaalensis* Kok) 4; (= *D. eriantha* var. *stolonifera* Stapf) 2; (= *D. geniculata* Stent) 2; (= *D. glauca* sensu Stent, non A. Camus) 2; (= *D. pentzii* Stent) 2; (= *D. pentzii* Stent var. *stolonifera* (Stapf) Henr.) 2, 4; (= *D. setivalva* Stent) 4; (= *D. smutsii* Stent) 2; (= *D. stentiana* Henr.) 2; (= *D. valida* Stent) 2; (= *D. valida* Stent var. *glauca* Stent) 2.

Common finger grass.

Perennial; sometimes stoloniferous, or tufted and rhizomatous; 350–1400 mm tall. Leaf blades 50–400 mm long; 2–14 mm wide. Spikelets 2.2–4.0 mm long; 1 mm wide. Rhizomes knotty and unbranched; culms simple or branched, basal leaf sheaths silky and hairy. Racemes 3–15, digitate, 50–200 mm long; lower glume a membranous scale, ovate to acute; upper glume 1/3–2/3 as long as spike-

Fig. 63. Pl. 58.



let; lower lemma as long as spikelet; upper glume and lower lemma covered with hairs 1 mm long, purple and silvery.

Flowering January to April. Occurs in a wide range habitats. Dominant. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Zimbabwe. Pasture (cultivated and natural). A very variable grass with many forms.

Description: Chippindall 1955 (403). Illustration: Chippindall 1955 (fig. 338). Voucher: Smook and Gibbs Russell 2166. PRECIS code 9900890–01400.

***Digitaria eylesii* C.E. Hubb.**

Perennial; rhizomatous, or tufted; 400–650(–1000) mm tall. Leaf blades 50–130 mm long; 2–4 mm wide. Spikelets 2.3–3.0 mm long; 1 mm wide. Rhizomes creeping, branched, with cataphylls; racemes usually in pairs or threes, or rarely solitary, 100–180 (–240) mm long; female-fertile (upper) floret purplish brown or black.

Flowering January to April. Grows in wet places. Locally common. Biome: Savanna and Grassland. Zambia and Zimbabwe. See comment under *D. diagonalis* var. *diagonalis*.

Description: Chippindall 1955 (419). Illustration: Kok 1987 (fig. 8.14). Voucher: De Winter 739. PRECIS code 9900890–01500.

***Digitaria flaccida* Stapf**

Flaccid finger grass.

Perennial; densely tufted and rhizomatous; 250–400(–600) mm tall. Leaf blades 40–100 mm long; 1.5–3.0 mm wide. Spikelets 1–3 mm long; 1 mm wide. Knotty rhizomes with hairy cataphylls; inflorescence panicle-like with 6–17 racemes, 30–55 mm long; spikelets paired; upper glume and lower lemma covered with silky purplish hairs up to 2 mm long.

Flowering November to January. Mainly on rocky ground, mountain sourveld. Locally common. Biome: Grassland. Central Africa southwards. The silky hairy panicle resembles those in *Melinis* and *Brachiaria* species.

Description: Chippindall 1955 (400). Illustration: Kok 1987 (fig. 8.17). Voucher: Smook 1399. PRECIS code 9900890–01600.

***Digitaria gayana* (Kunth) Stapf**

Annual; loosely tufted; 130–300 mm tall. Leaf blades 20–70 mm long; 3.5–6.0 mm wide. Spikelets 2.4–2.8 mm long; 1 mm wide. Lower leaf sheaths glabrous or sparsely hairy; racemes 2–3, digitate, 40–100 mm long; spikelets in clusters of 3(–4); upper glume 4/5 length of spikelet, covered with silvery hairs 1 mm long; lower lemma with membranous interspaces, depressed on either side of midnerve, margin with copious purplish or silvery hairs 2–4 mm long.

Flowering February. A weedy species of disturbed areas, mainly sandy soils. Infrequent. Biome: Savanna. Tropical and sub-tropical Africa. Weed.

Description: Clayton et al. 1970–1982 (627). Illustration: Kok 1987 (fig. 8.17). Voucher: De Winter 9203. PRECIS code 9900890–01700.

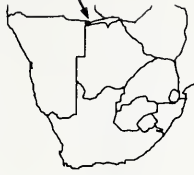


Digitaria gazensis Rendle

Perennial; usually rhizomatous and stoloniferous (rarely), or tufted (densely); 350–700 mm tall. Leaf blades 50–130 mm long; 3.0–4.5 mm wide. Spikelets 1.8–2.4 mm long; 0.8 mm wide. Rhizome short and knotty; basal sheaths hairy; racemes 5–10, subdigitate, 30–70 mm long; spikelets paired; upper glume as long as or slightly shorter than spikelet; upper glume and lower lemma covered with 2 mm long hairs, often purplish; female-fertile (upper) floret yellowish to dark purple-grey.

Flowering January to March. Mainly sandy soil but not in flood plain. Infrequent. Biome: Savanna. Tropical and sub-tropical Africa and Madagascar. Close to *D. rukwae* which has a brown upper floret and grows in flood plains.

Description: Clayton et al. 1970–1982 (643). Voucher: De Winter & Wiss 4450. PRECIS code 9900890–01800.

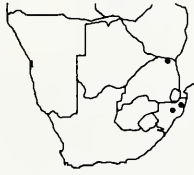


Digitaria gymnostachys Pilg.

Perennial; loosely tufted; 600–1000 mm tall. Leaf blades 60–300 mm long; 7–15 mm wide. Spikelets 3–4 mm long; 1 mm wide. Racemes 6–13, 100–300 mm long, subdigitate on central axis up to 60 mm long; spikelets paired; lower and upper glumes are small scales 0.2–0.5 mm long, separated from rest of spikelet by an internode 0.2–0.5 mm long.

Flowering February to April. Mainly sandy soil. Infrequent. Biome: Savanna. Tropical Africa.

Description: Clayton et al. 1970–1982 (636). Voucher: Ward 3852. PRECIS code 9900890–02000.



Digitaria longiflora (Retz.) Pers.

False couch finger grass.

Perennial (short lived), or annual; mat-forming and stoloniferous, or tufted (loosely); 100–350 mm tall. Leaf blades 18–70 mm long; 1.6–4.5 mm wide. Spikelets 1.2–1.6 mm long; 0.6 mm wide. Culms rooting from lower nodes; racemes 2(–3), digitate, 30–70 mm long; spikelets in pairs or threes and tend to bend outwards; rachis winged with low rounded midrib; upper glume and lower lemma as long as spikelet and covered with hairs 0.2 mm long; female-fertile (upper) lemma grey to purplish.

Flowering October to June. Disturbed areas, mainly sandy soil. Common. Biome: Savanna. Pan-tropical. Ornamental (lawns), or weed.

Description: Clayton et al. 1970–1982 (635). Illustration: Kok 1987 (fig. 8.10). Voucher: Smook 3157. PRECIS code 9900890–02100.



Digitaria maitlandii Stapf & C.E. Hubb.

(=*D. apiculata* Stent) 3.

Perennial; tufted; 220–410 mm tall. Leaf blades 40–130 mm long; 2–4 mm wide. Spikelets 1–2 mm long; 0.8–1.0 mm wide. No rhizome; racemes 3–6, 50–80 mm long, subdigitate on a short central axis; spikelets in groups of 3, glabrous or with a few hairs; female-fertile (upper) floret



purplish brown or black.

Flowering November to May. Mountain grassland. Infrequent. Biome: Grassland. Mozambique and up to Zambia.

Description: Chippindall 1955 (418). Illustration: Kok 1987 (fig. 8.15). Voucher: Scheepers 831. PRECIS code 9900890–02200.

Digitaria maniculata Stapf

Annual; partially mat-forming; 80–150 mm tall. Leaf blades 10–30 mm long; 1.5–3 mm wide. Spikelets 2.5–2.7 mm long; 0.8 mm wide. Culms rooting from lower nodes; racemes 2–3, digitate, 40–80 mm long; spikelets paired; lower glume clasping the spikelet and hairy; upper glume and lower lemma as long as spikelet and covered with hairs 0.2 mm long.

Flowering December to March. Sandy flats near rivers. Infrequent. Biome: Savanna. Zaire southwards.

Description: Kok 1987 (176). Illustration: Kok 1978 (fig. 8.8). Voucher: De Winter and Marais 4638. PRECIS code 9900890–02400.



Digitaria milanjana (Rendle) Stapf

Milanje finger grass.

Perennial; rhizomatous and stoloniferous, or tufted; 500–1300 mm tall. Leaf blades 60–300 mm long; 2–8 mm wide. Spikelets 2.5–3.2 mm long; 0.8 mm wide. Rhizomes branched, slender and elongate; culms usually straight and erect; racemes 3–12, digitate, 80–250 mm long; spikelet similar to *D. eriantha* but hairs yellowish or brown and nerves of lower lemma scaberulous.

Flowering January and February. Occurs in a wide range of habitats, often in disturbed areas. Locally common. Biome: Savanna. Tropical and sub-tropical Africa. Natural pasture. A variable tropical species, according to Clayton et al. 1982 (648) which can be separated from its southern allies *D. eriantha* and *D. didactyla* by the scabrid nerves on the lower lemma.

Description: Chippindall 1955 (407), Clayton et al. 1970–1982 (647). Illustration: Kok 1978 (fig. 8.31). Voucher: Voster 2779. PRECIS code 9900890–02500.



Digitaria monodactyla (Nees) Stapf

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(=*D. monodactyla* Stapf var. *explicata* Stapf) 2.

One finger grass.

Perennial; densely tufted; 200–550 mm tall. Leaf blades 30–60 mm long; 1.8–2.2 mm wide. Spikelets 2.8–3.2 mm long; 1 mm wide. Culm with hairy cataphylls; leaf blades often rolled; raceme solitary, 50–180 mm long; spikelets in pairs; upper glume and lower lemma covered with yellow hairs 1 mm long; female-fertile (upper) floret light brown.

Flowering November to February. Open grassland, usually highland sourveld. Locally dominant. Biome: Savanna and Grassland. Tropical Africa southwards. May be confused with *Elionurus muticus*, which has a sessile spikelet and a 2-lobed lower glume.

Description: Chippindall 1955 (415). Illustration: Chippindall 1955 (fig. 347). Voucher: Smook 4789. PRECIS code 9900890–02700.



Digitaria natalensis Stent

(=*D. littoralis* sensu Stent, non Salisb.) 2; (= *D. littoralis* sensu Stent, non Salisb. var. *prostrata* Stent) 4; (= *D. macroglossa* Henr.) 2; (= *D. macroglossa* Henr. var. *prostrata* (Stent) Henr.) 2; (= *D. natalensis* Stent subsp. *stentiana* Henr.) 2; (= *D. rigida* Stent) 2.



Coast finger grass.

Perennial; loosely to densely tufted and rhizomatous; 600–1500 mm tall. Leaf blades 80–250 mm long; 2–6 mm wide. Spikelets 2.8–3.5 mm long; 0.8 mm wide. Rhizomes knotty; culm lower nodes straight and covered by bright, reddish-brown sheaths; ligule membranous, 3.5–12.0 mm long; racemes 4–12, digitate, 100–200 mm long; spikelet characters similar to *D. eriantha*.

Flowering December to June. Mainly sandy ground. Locally dominant. Biome: Fynbos, Savanna, and Grassland. Mozambique.

Description: Chippindall 1955 (407). Illustration: Kok 1987 (fig. 8.32). Voucher: Smook 5759. PRECIS code 9900890–02750.

Digitaria nuda Schumach.

(=*D. borbonica* Desv.) 3.



Annual; tufted; 200–500 mm tall. Leaf blades 20–135 mm long; 2–10 mm wide. Spikelets 1.6–2.3 mm long; 0.8 mm wide. Culms decumbent at base, geniculate and ascending, rooting from lower nodes; racemes 3–8, digitate or subdigitate, 40–100 mm long; lower glume absent, or if present then a minute rim, obscure.

Flowering November to April. Open disturbed areas. Locally common. Biome: Savanna. Mainly tropical Africa, also Brazil and Indonesia. Weed.

Description: Clayton et al. 1970–1982 (654). Voucher: Du Toit PRE 58243. PRECIS code 9900890–02900.

Digitaria perrottetii (Kunth) Stapf

Whorled finger grass.



Annual; loosely tufted; 400–800 mm tall. Leaf blades 30–90 mm long; 3–15 mm wide. Spikelets 1.5–2.0 mm long; 1 mm wide. Culms decumbent and rooting from lower nodes; panicle 80–200 mm long, racemes arranged in 8–12 whorls on a central axis, each whorl consists of 4–8 racemes 20–50 mm long; spikelets solitary or in pairs, widely spaced on axis; upper glume as long as spikelet.

Flowering January to June. Damp, shady, sandy areas. Locally common. Biome: Savanna. Central Africa and Madagascar.

Description: Chippindall 1955 (400). Illustration: Kok 1987 (fig. 8.20). Voucher: Smook 1985. PRECIS code 9900890–03100.

Digitaria polyphylla Henr.

Perennial; rhizomatous and stoloniferous, or tufted (densely); 300–500 mm tall. Leaf blades 50–130 mm long; 2.5–5.0 mm wide. Spikelets 2.3–3.0 mm long; 1 mm wide. Rhizome knotty, culms with lower nodes unbranched, while middle and upper nodes are profusely branched and form leafy tufts; racemes 2–6, digitate, 30–80 mm long; spikelet characters similar to *D. eriantha*.

Flowering February to April. Sandy and stony ground, low rainfall areas. Locally common. Biome: Savanna. Endemic.

Description: Chippindall 1955 (414). Illustration: Chippindall 1955 (fig. 345). Voucher: Acocks 2078. PRECIS code 9900890–03300.

**Digitaria remotigluma** (De Winter) Clayton

(=*Digitariella remotigluma* De Winter) 3.



Annual; tufted; 100–400 mm tall. Leaf blades 15–80 mm long; 1–3 mm wide. Spikelets 7–10 mm long; 1 mm wide. Culms decumbent at base and rooting from lower nodes; racemes 2–5, digitate, 25–120 mm long; spikelets in pairs; internode 0.7–2.0 mm long between lower and upper glume; upper glume acuminate and 7–10 mm long; lower lemma finely acute, 13–16 mm long.

Flowering November to February. Damp, sandy soils. Infrequent. Biome: Savanna. East Africa and southwards. The awnlike tip to the upper glume and lower lemma are characteristic for this species.

Description: Clayton et al. 1970–1982 (638). Illustration: Kok 1978 (fig. 8.5). Voucher: Smith 2659. PRECIS code 9900890–03350.

Digitaria rukwae Clayton

Perennial; rhizomatous and tufted (loosely); 250–1200 mm tall. Leaf blades 50–300 mm long; 2–7 mm wide. Spikelets 2.0–2.6 mm long; 0.8 mm wide. Rhizomes scaly; basal sheaths glabrous or silky pubescent; racemes 6–25, 40–100 mm long, borne irregularly or in untidy whorls upon an axis 40–200 mm long; upper glume 3/4 to as long as to equalling spikelet; lower lemma as long as the spikelet with fine brown hairs mainly along the margins; female-fertile (upper) floret ellipsoid, brown.

Flowering March. Flood plains and alluvial soils. Infrequent. Biome: Savanna. Northwards to Tanzania. Close to *D. gazensis*, which has the upper floret pale grey or yellowish to dark purple-grey and does not grow in floodplains.

Description: Clayton et al. 1970–1982 (646). Voucher: Ellis 4517. PRECIS code 9900890–03360.



Fig. 66. *Digitaria sanguinalis****Digitaria sanguinalis* (L.) Scop.**

Crab finger grass.

Annual; tufted; 200–600 mm tall. Leaf blades 27–170 mm long; 3–10 mm wide. Spikelets 2.3–3.1 mm long; 1 mm wide. Culms branched, decumbent and rooting from lower nodes; racemes 3–12, digitate or subdigitate, 40–105 mm long; lower lemma equalling or shorter than spikelet, scaberulous along nerves, very rarely with a ciliate frill.

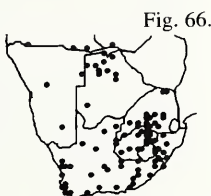
Flowering November to May. Disturbed areas. Locally dominant. Naturalized from Europe. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. Pan-tropical. Weed.

Description: Chippindall 1955 (399). Illustration: Kok 1987 (fig. 8.22). Voucher: Smook 4674. PRECIS code 9900890-03370.

***Digitaria seriata* Stapf**(=*D. polevansii* Stent) 4.

Kuruman finger grass.

Perennial; loosely or densely tufted, stoloniferous, and rhizomatous; 500–1200 mm tall. Leaf blades 100–350 mm long; 3–9 mm wide. Spikelets 2.5–3.2 mm long; 1 mm wide. Rhi-



zomes knotty, branched and woody; base of culm bulbous and covered with densely hairy scales; racemes 3–12, digitate to subdigitate, 100–230 mm long; spikelets like those of *D. eriantha*.

Flowering January to April. Mainly sandy soil. Locally common. Biome: Savanna and Grassland. Zimbabwe.

Description: Chippindall 1955 (414). Illustration: Chippindall 1955 (fig. 344). Voucher: De Winter 7377. PRECIS code 9900890-03450.

***Digitaria setifolia* Stapf**

Fine-leaved finger grass.

Perennial; densely tufted; 200–500 mm tall. Leaf blades 50–140 mm long; 1.5–3.0 mm wide. Spikelets 3–4 mm long; 1 mm wide. Old leaf sheaths break up into brown fibres at base; leaf blades usually rolled; racemes 40–120 mm long, (2–)3–4(–5), subdigitate on a short central axis; spikelets in pairs or threes; upper glume and lower lemma with conspicuous rows of bright brown, clavate hairs; female-fertile (upper) floret dark brown.

Flowering September to January. Grows in mountain sourveld areas, usually in damp places or vleis. Locally common. Biome: Grassland. From the Congo south, excluding east Africa and Angola.

Description: Chippindall 1955 (416). Illustration: Kok 1987 (fig. 8.13). Voucher: Smook 2570. PRECIS code 9900890-03550.

***Digitaria ternata* (A. Rich.) Stapf**

Blackseed finger grass.

Annual; loosely tufted; 200–600 mm tall. Leaf blades 20–200 mm long; 1–7 mm wide. Spikelets 1.5–2.3 mm long; 0.8 mm wide. Racemes 40–200 mm long, 2–6, in pairs or subdigitate on short central axis, midrib winged; spikelets in clusters of (2–)3; pedicels with a corona of short hairs at apex; upper glume 3/4, as long as spikelet; upper glume and lower lemma covered with white clavate hairs; female-fertile (upper) floret dark brown or purplish black.

Flowering November to May. Damp and disturbed areas. Locally dominant (roadsides). Biome: Savanna and Grassland. Africa to Far East.

Description: Chippindall 1955 (418). Illustration: Chippindall 1955 (fig. 348). Voucher: Smook 4712. PRECIS code 9900890-04100.

***Digitaria thouaresiana* (Fluegge) A. Camus**

(=*D. melanochila* Stapf) 3;
(=*D. tricosutula* (Hack.)
Henr.) 3.

Annual; tufted; 20–100 mm tall. Leaf blades 3–20 mm long; 2–8 mm wide. Spikelets 1.0–1.7 mm long; 0.8 mm wide. Racemes 2–14, subdigitate, 20–120 mm long; spikelets in clusters of 3–4 on winged rachis; pedicels without corona of hairs, only a few hairs at apex; upper glume and lower lemma rarely glabrous, usually covered with white clavate hairs; female-fertile (upper) floret dark brown to black.

Flowering February to May. Marshy places and disturbed sites. Locally common. Biome: Savanna and Grassland. East Africa.

Description: Clayton et al. 1970–1982 (631). Voucher: Smook 3071. PRECIS code 9900890-04300.



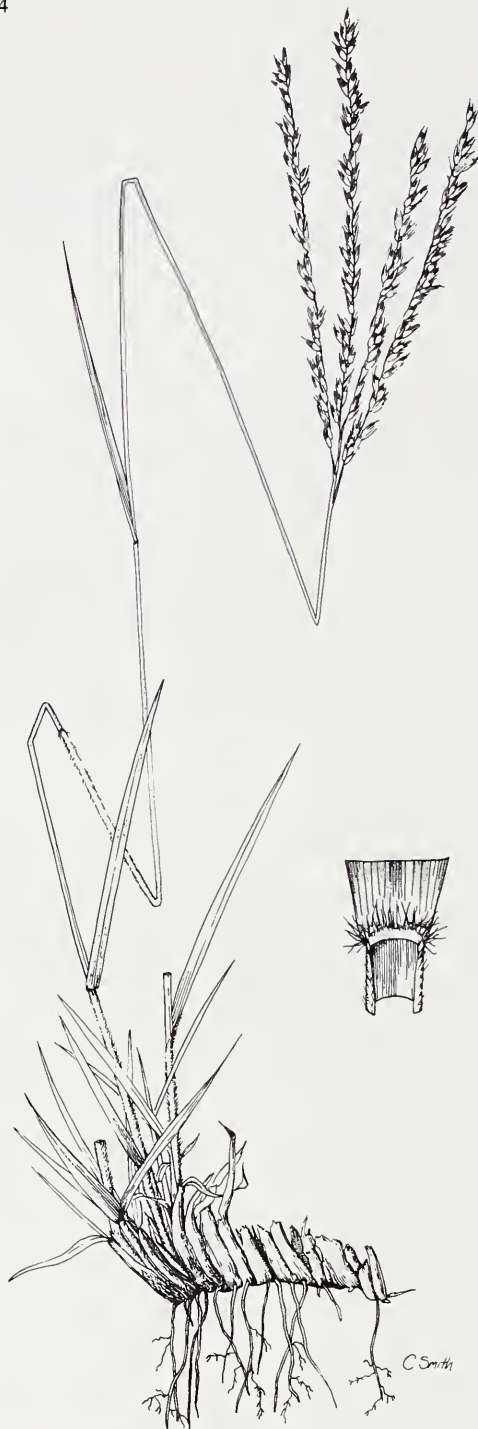


Fig. 67. *Digitaria tricholaenoides*

***Digitaria tricholaenoides* Stapf**

Purple finger grass.

Perennial; rhizomatous and tufted; 200–550 mm tall. Leaf blades 40–200 mm long; 2–7 mm wide. Spikelets 3–5 mm long; 1 mm wide. Rhizome oblique, up to 100 mm long, covered with hairy, persistent, overlapping bases of



Fig. 67.

old leaf sheaths; racemes 2–3(–7), subdigitate, 30–130 mm long; spikelets in clusters of 2–5; upper glume 1/2–2/3 length of spikelet, covered with silvery or purplish hairs 1–2 mm long; lower lemma covered (except for central interspace) with silvery or purplish hairs 2–4 mm long.

Flowering November to March. In open, sourveld grassland mainly on stony soil. Locally dominant. Biome: Savanna and Grassland. Endemic.

Description: Chippindall 1955 (402). Illustration: Chippindall 1955 (fig. 337). Voucher: Smook 4932. PRECIS code 9900890–04400.

***Digitaria velutina* (Forssk.) Beauv.**

(=*D. zeyheri* (Nees) Henr.) 3.

Long-plumed finger grass.

Annual; very loosely tufted; 150–800 mm tall. Leaf blades 40–150 mm long; 3–10 mm wide. Spikelets 1.5–2.0 mm long; 0.5 mm wide. Culms decumbent at base, rooting from lower nodes; inflorescence panicle-like, racemes 35–100 mm long, 5–15, subdigitate on a relatively long central axis 25–50 mm long; lower glume obscure or an ovate scale up to 0.2 mm long; upper glume and lower lemma almost glabrous.

Flowering December to May. Open disturbed areas. Locally dominant. Biome: Savanna and Grassland. Northwards to Egypt. Weed.

Description: Chippindall 1955 (400). Illustration: Chippindall 1955 (fig. 336). Voucher: Smook 2655. PRECIS code 9900890–04900.

***Digitaria violascens* Link.**

Annual; tufted; to 900 mm tall. Leaf blades 40–220 mm long; 3–6 mm wide. Spikelets 1.35–1.7 mm long; 0.8 mm wide. Culms erect or decumbent and rooting from lower nodes; racemes 3–6, digitate to subdigitate, 30–50 mm long; upper glume and lower lemma as long as spikelet, glabrous or with minute hairs, green veins very distinctive; female-fertile (upper) lemma dark brown.

Flowering March. Disturbed areas and woodland margins. Infrequent. Naturalized, area of origin unknown. Biome: Grassland. Tropics and sub-tropics of world. Weed.

Description: (Webster 1983 (211)). Voucher: Ellis 4416. PRECIS code 9900890–04970.

***Diheteropogon* Stapf**

Annual, or perennial (slender); caespitose. Culms 150–2300 mm high; herbaceous (to woody at base); unbranched above (mainly). Leaf blades linear or linear-lanceolate; flat. Ligule an unfringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (all male or sterile at bases of 'racemes', heterogamous above); overtly heteromorphic (pedicellate spikelets awnless or aristulate, larger, callus glabrous).

Inflorescence of spike-like main branches, or panicleate (of paired 'racemes', terminal or in a scanty false panicle); spatheate; a complex of 'partial inflorescences' and intervening foliar organs. Spikelet-bearing axes 'racemes'; paired (not deflexed); with substantial rachides; disarticulating at the joints. 'Articles' non-linear (thickened and hollowed at the summit).

Spikelets in pairs; consistently in 'long-and-short' com-



Fig. 68. *Diheteropogon amplexens*

binations; these pedicellate/ sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite (save at the base of the raceme). The pedicellate spikelets male-only, or sterile (?). Female-fertile spikelets 5–9 mm long; compressed dorsiventrally; falling with the glumes (or with a slight tendency to disarticulate above them). *Callus* long. Glumes two; more or less equal; awnless; very dissimilar (somewhat leathery; G1 bicarinate, grooved between the keels; G2 not bicarinate). *Proximal incomplete florets* 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); incised; awned. Awns 1; median; from the sinus; geniculate (twice-geniculate); much longer than the body of the lemma (and sturdy). Palea present; conspicuous but relatively short (small). Lodicules 2. Stamens 3. Ovary glabrous.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 5 species. Tropical Africa. Helophytic; in open habitats (savanna); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 2 indigenous species.

References. 1. Clayton. 1966. Kew Bull. 20: 75. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell & M. Koekemoer.

- 1(0). Leaf blades filiform, usually narrower than 3 mm if unrolled, base not rounded; lower glume of sessile spikelet acutely bent on either side of the deep median longitudinal groove ***D. filifolius***
 Leaf blades expanded, usually wider than 3 mm, base rounded or amplexicaul; lower glume of sessile spikelet rounded on either side of the deep median longitudinal groove ***D. amplexens***

Diheteropogon amplexens (Nees) Clayton

Fig. 68. Pl. 60.

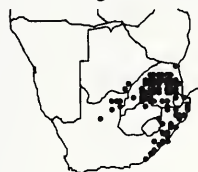
(=*Andropogon amplexens* Nees) 1.

Broad-leaved bluestem, bree-blaarandropogon.

Perennial; rhizomatous; 300–2000 mm tall. Leaf blades 150–300 mm long; to 20 mm wide. Spikelets (sessile) 7–9 mm long (pedicellate longer). Leaf blade bases rounded, clasping the stem; young growth waxy.

Flowering November to April. Poor shallow soils on stony slopes and in woodland. Common. Biome: Savanna and Grassland. Tropical Africa. *Cymbopogon excavatus* has similar leaf blades, but it is aromatic and often has swollen raceme bases.

Description: Chippindall 1955 (498), Clayton et al. 1970–1982 (784). Illustration: Chippindall 1955 (pl. 21), Clayton et al. 1970–1982 (fig. 182), Flower. Pl. Afr. (24: 922). Voucher: Moll 617. PRECIS code 9900810–00100.



Diheteropogon filifolius (Nees) Clayton

(=*Andropogon filifolius* (Nees) Steud.) 1.

Draadbloustam, thread-leaved andropogon.

Perennial; rhizomatous and tufted; 150–600 mm tall. Leaf blades 100–500 mm long; filiform or to 3.5 mm wide. Spikelets (sessile) 6–8 mm long (pedicellate much longer). Leaf blades thread-like, bluish-green.

Flowering October to April. Sour open grassveld on hillsides. Common. Biome: Savanna and Grassland. Southern tropical Africa. *Andropogon schirensis* is closely related, but has expanded leaf blades and a shorter callus.

Description: Chippindall 1955 (497). Illustration: Chippindall 1955 (fig. 401). Voucher: Pole Evans 1009. PRECIS code 9900810–00200.



Dinebra Jacq.

Annual; caespitose to decumbent. Culms 150–1200 mm high; herbaceous; unbranched above. Leaf blades usually flat. Ligule a fringed membrane (very narrow).

Inflorescence of spike-like main branches (a raceme of numerous small spikes which become deflexed at maturity, the lower spikelets of each spike often replaced by small deciduous branchlets); spatheate. Spikelet-bearing axes disarticulating, or persistent; falling entire (the smaller laterals deciduous).

Spikelets solitary; biseriate; *all sessile*; 3.5–10 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets (when two or more florets). Glumes present; two; more or less equal; much exceeding the spikelets; awned (acuminate-aristate); very dissimilar, or similar (leathery or membranous, the lower often very asymmetrical). Incomplete florets distal to the female-fertile florets; *proximal incomplete florets absent*.

Female-fertile florets 1–2. Lemmas less firm than the glumes to similar in texture to the glumes (thinly membranous); 3 nerved; awnless to mucronate. Palea present. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; ellipsoid; hilum short; pericarp fused; embryo large.



H. W. H. de Lint

Fig. 69. *Dinebra retroflexa*

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines uneven. PCR sheath extensions absent. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 3 species. Tropical Africa, Asia. Helophytic to mesophytic (in seasonally wet places); in shade, or in open habitats (savanna); glycophytic. Namibia, Botswana, Transvaal, Swaziland, Natal, and Cape Province. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Dinebra retroflexa (Vahl) Panz. var. *condensata* S.M.

Phillips

Fig. 69. Pl. 61.

Kattestertgras, catstail grass.

Annual; loosely tufted; 130–820 mm tall. Leaf blades 45–280 mm long; 4–8 mm wide. Spikelets 5.7–9.0 mm long. Spikes up to 50 mm long; glumes 6.0–8.2 mm long, with spreading aristate tips.



Flowering December to May. Usually on disturbed soil in moist weedy places, often in the shade and on black turf or waterlogged soils. Common. Biome: Savanna. Tropical Africa through Egypt and Iraq to India. Weed (in ricefields mostly).

Description: Phillips 1974 Kew Bull. 28(3), Chippindall 1955 (185), Clayton et al. 1970–1982 (273). Illustration: Chippindall 1955 (fig. 160), Clayton et al. 1970–1982 (fig. 75). Voucher: Acocks 16804. PRECIS code 9903300–00100.

Diplachne P. Beauv.

Sometimes included in *Leptochloa*.

Perennial; long-stoloniferous, or caespitose (some tall). Culms 300–2700 mm high; herbaceous; unbranched above. Leaf blades linear; flat, or rolled (often involute). Ligule an unfringed membrane, or a fringed membrane (sometimes much reduced).

Inflorescence of spike-like main branches (a contracted panicle of spike-like racemes), or a single raceme (rarely), or paniculate; open; digitate or subdigitate, or non-digitate; spatheate. Spikelet-bearing axes persistent.

Spikelets not secund (or scarcely so); biseriate; 6–15 mm long (narrow); not noticeably compressed to compressed dorsiventrally (more or less terete); disarticulating above the glumes; disarticulating between the florets. Glumes two; relatively large; very unequal, or more or less equal; markedly shorter than the spikelets; awnless; similar (membranous). All florets female-fertile, or distal incomplete florets also present, these awnless; proximal incomplete florets absent.

Female-fertile florets 5–20. Lemmas 3 nerved; entire, or incised (bidentate); awnless, or mucronate (from the sinus), or awned. Awns when present 1; from the sinus, or dorsal; non-geniculate; much shorter than the body of the lemma. Palea present. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; pericarp free, or loosely adherent, or fused; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 18 species. Tropical and subtropical. Helophytic, or mesophytic, or xerophytic; in shade and in open habitats (woodland, savanna, dry and swampy soils); halophytic and

glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 4 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Launert. 1970. FSWA. 3. Launert. 1974. Bol. Soc. Brot. Ser. 2. 47: 349. 4. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Ligule a fringe of hairs, to 1.5 mm long; lemma tips awnless, obtuse to notched; inflorescence of 2–8 distant spikes; spikelets densely packed and overlapping **D. eleusine**
Ligule membranous, exceeding 2 mm; lemma tips acute or shortly mucronate; inflorescence an open panicle; spikelets less dense and usually not overlapping 2
- 2(1). Plants reed-like, exceeding 1500 mm in height; panicle 230–400 mm long; spikelets overlapping; primary branches slender, 120–200 mm long; lemma awned; awn to 1.2 mm long; from Botswana and Namibia **D. gigantea**
Plants not reed-like, to 1600 mm tall; panicle usually 90–220 mm long; spikelets not overlapping; primary branches firm, to 60 mm long; lemma awnless; also growing outside Botswana 3
- 3(2). Glumes shorter than 2 mm; lemmas shorter than 3 mm; spikelets to 10 mm long; plants to 700 mm tall; leaf blades not exceeding 150 mm; racemes spreading horizontally; from Namibia **D. cuspidata**
Glumes 2.5–3.2 mm long; lemmas 4.0–5.2 mm long; spikelets 5–15 mm long; plants to 1600 mm tall; leaf blades to 300 mm long; racemes not spreading more than 70 degrees; widely distributed **D. fusca**

Diplachne cuspidata Launert

Perennial; tufted (culms geniculate); 320–650 mm tall. Leaf blades 20–150 mm long; 2–4 mm wide. Spikelets 7–10 mm long. Ligule membranous, to 3 mm long; lemmas 2.8–3.0 mm long, tips rounded and minutely awned.



Flowering March to April. Clayey soils, in water or in mopaneveld. Infrequent. Biome: Savanna. Possibly also in Angola. Closely related to *D. fusca*, which is larger in all dimensions and has a wider distribution.

Description: Launert 1970 (160:68). Voucher: Smook 5111. PRECIS code 9903450–00200.

Diplachne eleusine Nees

Perennial; rhizomatous and tufted (culms geniculately ascending); 520–1270 mm tall. Leaf blades 120–270 mm long; 2–4 mm wide. Spikelets 4–8 mm long. Ligule a hairy membrane, 1.5 mm long; spikes 2–8, distant; spikelets overlapping, 5–10-flowered; lemma tip obtuse to minutely notched.



Flowering November to April. Sandy soils, rocky slopes or in the shade of trees, occasionally on turf soils. Common. Biome: Savanna and Grassland. ?Endemic. Other *Diplachne* species have membranous ligules and acute or mucronate lemma tips.

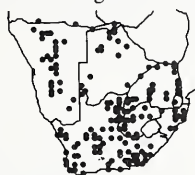
Description: Stapf 1898–1900 (591). Chippindall 1955 (121). Illustration: Chippindall 1955 (fig. 91). Voucher: Smook 4249. PRECIS code 9903450–00300.

Diplachne fusca (L.) Beauv. ex Roem. & Schult.

Fig. 70. Pl. 62.

(=*D. malabarica* sensu Adamson, non (L.) Merr.) 4.

Kuilgras, swamp grass.



Perennial; hydrophyte, rhizomatous, stoloniferous, and tufted; 220–1550 mm tall. Leaf blades 250–550 mm long; 3–5 mm wide.

Spikelets 6–14 mm long. Ligule a conspicuous membrane, to 5 mm long; racemes numerous; spikelets not overlapping, 5–12-flowered; lemma tips acute.

Flowering October to May. Sandy soil, almost always near or in fresh or brackish water to 500 mm deep. Common. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. Old world tropics & subtropics and in Australia. Pasture (in vleis and brackish soil). This grass covers nearly all possible variations in habit possible in a grass. Closely related to *D. cuspidata* from Namibia, which is smaller with shorter leaf blades, glumes and lemmas.

Description: Chippindall & Crook 1976 (205), Launert

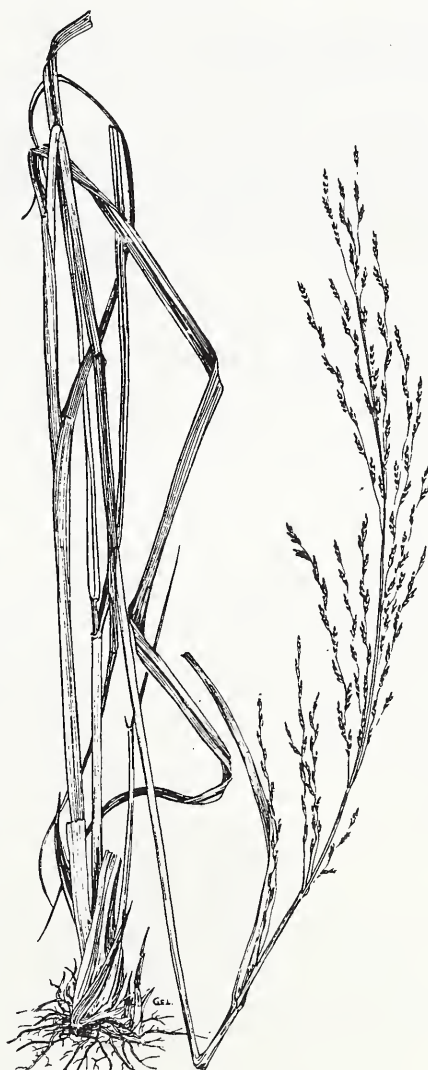


Fig. 70. *Diplachne fusca*

1970 (160:68), Stapf 1898–1900 (591), Chippindall 1955 (119), Clayton et al. 1970–1982 (281). Illustration: Chippindall 1955 (fig. 90), Clayton et al. 1970–1982 (fig. 77). Voucher: Scheepers 1495, Goldblatt 2820. PRECIS code 9903450–00400.

Diplachne gigantea Launert

Robust perennial; hydrophyte and rhizomatous; 1500–2700 mm tall. Leaf blades 300–650 mm long; 4–5 mm wide. Spikelets 10–14 mm long. Ligule 4–6 mm long; lemma tip ending in a short mucro, 0.25–0.50 mm long.



Flowering February to May. Amongst reeds and waterlilies, on sandbanks and along rivers. Rare. Biome: Savanna. Tropical Africa. Distinguished from *D. cuspidata* and *D. fusca*, which are not reed-like and have smaller panicles in which the spikelets do not overlap.

Description: Clayton et al. 1970–1982 (282). Voucher: Smith 1387. PRECIS code 9903450–00500.

Dregeochloa Conert

Sometimes included in *Rytidosperma*, *Danthonia* sensu lato.

Perennial; long-stoloniferous (sometimes), or caespitose (with short often branched creeping rhizomes). Culms 40–250 mm high; herbaceous; unbranched above (but usually considerably branched just below the soil surface). Leaf blades linear, or ovate-lanceolate to ovate; to 3 mm wide; usually folded; not disarticulating. Ligule a fringe of hairs (minute).

Inflorescence a single raceme, or paniculate (of 4–12 spikelets, rarely a reduced, contracted panicle); contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; not two-ranked; not in distinct 'long-and-short' combinations; 10–13 mm long; somewhat compressed laterally; disarticulating above the glumes. Callus long. Glumes two; more or less equal; about equalling the spikelets to much exceeding the spikelets; awnless; similar (lanceolate; scarious, or herbaceous below. G1 narrower). Incomplete florets distal to the female-fertile florets, merely underdeveloped, awned; proximal incomplete florets absent.

Female-fertile florets 3–8. Lemmas similar in texture to the glumes (membranous); hairy (hairs in tufts, in transverse rows, lobes minutely hairy, with a row of tufts at their base, and larger marginal tufts beneath); 7–9 nerved; incised; 2 lobed (the lobes acute or bristle-tipped); awned. Awns 1; median; from the sinus; geniculate; about as long as the body of the lemma. Palea present; relatively long; 2-nerved. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary sparsely hairy. Fruit small; hilum short (punctiform); pericarp free.



Fig. 71. *Dregeochloa pumila*

Photosynthetic pathway. C₃ (obviously so in *D. pumila*, but but the anatomy of *D. calvinensis* is equivocal, to say the least: most mesophyll cells are no more than one cell distant, and the only seeming exceptions are at the tops of the adaxial ribs. A candidate for intermediacy); XyMS+.

Cytology, classification, distribution. Arundinoideae; Danthoniaceae. 2 species. South and south west Africa. Xerophytic (*D. pumila* in blown sand over rocks); in open habitats; maritime-arenicolous (sometimes), or glycophytic (usually). Namibia and Cape Province. 2 indigenous species.

References. 1. Conert. 1966. Senckenb. Biol. 47: 338.

Species treatment by N.P. Barker.

- 1(0). Body of lemma densely pubescent below tufts of hairs across back; leaf blade apices rounded, terminating in a minute spine ***D. pumila***
Body of lemma glabrous above and below tufts of hairs across back; leaf apices pungent but not terminating in a spine ***D. calvinensis***

Dregeochloa calvinensis Conert

Perennial; shortly rhizomatous; 150–250 mm tall. Leaf blades 10–120 mm long; 1.6–2.3 mm wide. Spikelets 12–15 mm long. Plant bases somewhat swollen, covered by old leaf sheaths; sheath mouth with short, inconspicuous hairs; leaf blades glabrous or inconspicuously pubescent; panicle contracted, 30–50 mm long; spikelets 4–5-flowered, uppermost reduced; glumes 9–15 mm long, 3–5-nerved; lemmas 4.5–6.0 mm long, including lobes, with 3 tufts of white hairs on either side of central nerve, glabrous above and below these tufts; lemma lobes acuminate, apically produced into a short bristle; central awn 8–10 mm long, geniculate.



Flowering October. Limestone outcrops. Locally common. Biome: Nama-Karoo. Endemic. A relatively unknown species from a poorly collected area.

Description: Conert 1966 (335). Illustration: Conert 1966 (335). Voucher: Acocks 19040. PRECIS code 9902045–00100.

Dregeochloa pumila (Nees) Conert

Fig. 71. Pl. 63.

(=*Danthonia pumila* Nees) 1.

Perennial; shortly rhizomatous; 40–70 mm tall. Leaf blades 10–25 mm long; 1.6–3.5 mm wide. Plant base covered in broad scales; leaf sheath mouth pubescent; leaf blades succulent in appearance, minutely but densely pubescent, apex rounded, spiny-apiculate; inflorescence a raceme (occasionally a panicle); spikelets 6–10-flowered; glumes 9–13 mm long, 5(–7)-nerved; lemma 3.0–3.5 mm long, including small, truncate lobes, with a row of hairs across the back below the awn, with a large tuft of hairs on each margin, projecting at an angle away from the margin and with two smaller tufts on each side of central nerve; central awn 4–7 mm long.



Flowering August to January (but also later). Rocky areas, in crevices or loose sand. Infrequent. Biome: Succulent Karoo and Desert. Endemic. Restricted to coastal belt, to 15 km inland, in areas subject to sea mists.

Description: Conert 1966 (335–343), Chippindall 1955 (245). Illustration: Conert 1966 (335–343), Chippindall 1955 (fig. 217). Voucher: Ellis 5076. PRECIS code 9902045–00200.

Echinochloa P. Beauv.

Ornithospermum Dumoulin, *Tema* Adans.

Annual, or perennial; caespitose to decumbent (or floating). Culms 400–3600 mm high; herbaceous; branched above, or unbranched above. *Leaf blades broad; flat. Ligule when present a fringe of hairs.*

Inflorescence of spike-like main branches (spikelets often hispid); with axes ending in spikelets; espatheate. Spikelet-bearing axes persistent.

Spikelets paired or clustered; 2.3–7 mm long; probably best interpreted as adaxial — i.e., in relation to the reduced, spikelet-bearing branch; compressed dorsiventrally; falling with the glumes. *Glumes* two; very unequal; awned, or awnless; very dissimilar (*G1* usually much shorter, ovate, often mucronate. *G2* strongly concave, acute, cuspidate or awned). *Proximal incomplete florets* 1; *sterile lemma* awned or acuminate; *palea*, palea fully developed, or reduced (e.g. *E. kimberleyensis*); male (rarely), or sterile.

Female-fertile florets 1. *Lemmas* decidedly firmer than the glumes; smooth; becoming indurated, or not becoming indurated (subcoriaceous to crustaceous); hairless (shiny); having the margins tucked in onto the palea; with a clear germination flap; 5 nerved; entire; awnless (obtuse to apiculate). *Palea* present (the tip reflexed); relatively long. *Lodicules* fleshy; glabrous. *Stamens* 3. *Ovary* glabrous. *Fruit* small; hilum short; embryo large.

Photosynthetic pathway. *C₄*; NADP-ME (3 species); XyMS-, PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicoideae; Paniceae. 30–40 species. In warm regions. Hydrophytic, helophytic, and mesophytic; mostly in open habitats (in water and moist or marshy places, also in disturbed ground and weedy places);

glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 10 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by H.M. Anderson.

- 1(0). Ligule absent in lower and upper leaves 2
Ligule a fringe of hairs, at least in the lower leaves 5
- 2(1). Racemes distinctly compound with short secondary branchlets, the inflorescence untidily ovate; spikelets often with a short curved awn *E. crus-pavonis*
Racemes not or inconspicuously compound, inflorescence elongate; spikelets rarely with a short curved awn 3
- 3(2). Plants perennial, rhizomatous *E. haploclada*
Plants annual, not rhizomatous 4
- 4(3). Racemes untidily 2 to several rowed, 20–100 mm long and usually with secondary branchlets at the base; spikelets 3–4(–7) mm long, awnless or rarely with awns up to 5 mm long *E. crus-galli*
Racemes neatly 4-rowed, usually 10–25 mm long, with no secondary branchlets at the base, awnless *E. colona*
- 5(1). Plants always annual, racemes neatly 4-rowed *E. ugandensis*
Plants mainly perennial, racemes not neatly 4-rowed 6
- 6(5). Spikelets seldom over 2.5 mm long, commonly round to elliptic, often awned, the awns 5(–15) mm long *E. haploclada*
Spikelets seldom under 3 mm long, commonly elliptic to elongate, awns absent or when present 5–25 mm long 7
- 7(6). Spikelets awnless (rarely with a subulate point up to 3 mm long) 8
Spikelets with awns usually longer than 5 mm 9
- 8(7). Culms 500–900 mm tall; leaves 180–220 mm long; inflorescence (80–)120(–180) mm long *E. holubii*
Culms 1000–4000 mm tall; leaves 200–600 mm long; inflorescence (150–)200(–400) mm long *E. pyramidalis*
- 9(7). Inflorescence open, the branches clearly second; spikelets narrowly ovate, 4–6 mm long *E. stagnina*
Inflorescence dense, the branches not clearly second; spikelets narrowly elliptic, 3.0–3.5(–4.0) mm long *E. jubata*

Echinochloa colona (L.) Link

Jungle rice.

Annual; hydrophyte, stoloniferous, and tufted; 100–1000 mm tall. Leaf blades 50–300 mm long; 2–8 mm wide. Spikelets 1.5–3 mm long; 1.0–1.5 mm wide. Ligule absent; inflorescence 10–150 mm long; racemes neatly 4-rowed, 10–25 mm long; spikelet pubescent; lower floret male or sterile; lower lemma not awned (tip may be up to 1 mm long).

Flowering January to April. Muddy or swampy places. Common. Biome: Savanna, Grassland, and Nama-Karoo. Worldwide tropics and subtropics. Food and drink (cereal). This species may hybridize with *E. crus-galli* and *E. haploclada*.

Description: Chippindall 1955 (361), Clayton et al.



Fig. 72. *Echinochloa crus-galli*

1970–1982 (557). Illustration: Clayton et al. 1970–1982 (fig. 134). Voucher: Smook 4398. PRECIS code 9901120–00100.

***Echinochloa crus-galli* (L.) Beauv.**

(=*E. subverticillata* Pilg.) 2.

Barnyard millet.

Annual; hydrophyte, stoloniferous, and tufted; 250–1000 mm tall. Leaf blades 70–350 mm long; 4–20 mm wide. Spikelets 3–4(–7) mm long; 1–2 mm wide. Ligule absent; inflorescence 60–220 mm long; racemes untidily 2 to several-rowed, 20–100 mm long and usually with secondary branchlets at base; lower floret sterile; lower lemma usually awnless, rarely with an awn 5–10 mm long.

Flowering January to April. Swampy areas, wet places of cultivation. Locally common. Naturalized from temperate Eurasia. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Worldwide temperate and subtropical regions. Food and drink (cereal), or weed (polymorphic especially in rice fields). A very variable species, may be confused with *E. colona*, which has neat 4-rowed racemes and *E. crus-pavonis*, which has a larger inflorescence and racemes with many secondary branches.

Description: Chippindall 1955 (362), Clayton et al. 1970–1982 (557). Illustration: Chippindall 1955 (fig. 312). Voucher: Smook 5871. PRECIS code 9901120–00200.

***Echinochloa crus-pavonis* (Kunth) Schult.**

Gulf barnyard grass.

Annual, or perennial (rarely); hydrophyte, stoloniferous, and tufted; 500–2000 mm tall. Leaf blades 150–600 mm long; 5–25 mm wide. Spikelets 2.0–3.5 mm long; 1.0–1.5 mm wide. Ligule absent; inflorescence 100–300 mm long, untidily ovate; racemes 30–150 mm long, distinctly compound with short secondary branchlets; spikelets in dense clusters; lower floret male or sterile; lower lemma acute or with short curved awn 1–3(–7) mm long.

Flowering February to March. Along stream banks and swamps. Locally common. Biome: Fynbos and Grassland. Tropics of Africa and America. See note under *E. crus-galli*.

Description: Chippindall 1955 (362), Clayton et al. 1970–1982 (556). Illustration: Haefliger and Scholz 1980 Grass Weeds 1, Documenta, Ciba-Geigy (p.56). Voucher: Pole-Evans PRE 34612. PRECIS code 9901120–00300.

***Echinochloa haploclada* (Stapf) Stapf**

Perennial; hydrophyte, rhizomatous, and tufted; 300–3000 mm tall. Leaf blades 50–100 mm long; 3–10(–20) mm wide. Spikelets 1.5–2.5(–3.0) mm long; 1.0–1.5 mm wide. Ligule absent or a fringe of hairs; inflorescence 70–250 mm long; racemes 10–50 mm long, densely crowded with appressed spikelets; lower floret male; lower lemma acute or with awns 5–15 mm long.

Flowering March to April. Stream banks, dry river beds. Biome: Savanna and Grassland. Northwards to Sudan and Ethiopia. This species can hybridize with *E. colona*.

Description: Clayton et al. 1970–1982 (560). Voucher: Davidse and Ellis 5869. PRECIS code 9901120–00500.

***Echinochloa holubii* (Stapf) Stapf**

Kalahari water grass.

Perennial; hydrophyte, rhizomatous, and tufted; 500–900 mm tall. Leaf blades 180–220 mm long; (2–)4(–8) mm wide. Spikelets 2.5–3.5 mm long; 1.0–1.5 mm wide. Ligule a fringe of hairs, may be absent in upper leaves; inflorescence (80–)120(–180) mm long, racemes distant, 15–40 mm long; lower floret male or sterile; lower lemma awnless, tip acute to acuminate, 3 mm long.

Flowering December to April. Swampy areas, pans and vleis. Locally common. Biome: Savanna, Grassland, Nama-Karoo and Succulent Karoo. To Zimbabwe. Clayton 1982 (562) regards this species as a synonym of *E. pyramidalis*, which extends through tropical Africa. This has not been adopted for the FSA region, where the two species are distinguishable on size characters.

Description: Chippindall 1955 (361). Illustration: Clayton et al. 1970–1982 (fig. 309). Voucher: Smook 4415. PRECIS code 9901120–00600.

***Echinochloa jubata* Stapf**

Perennial; hydrophyte, rhizomatous, and stoloniferous; 500–2000 mm tall. Leaf blades 100–250 mm long; 3–15 mm wide. Spikelets 3.0–3.5(–4.0) mm long; 1 mm wide. Ligule a fringe of hairs, may be absent from upper leaves; inflorescence dense, 80–200 mm long; racemes 20–40 mm long; spikelets narrowly elliptic and closely packed; lower floret male or sterile; lower lemma with awns 3–25 mm long.

Flowering November to May. Growing in water and stream sides, often floating in water. Locally common. Biome: Savanna and Grassland. Northwards to the tropics. Clayton 1982 (564) records that *E. jubata* may be a southern variant of *E. stagnina*.

Description: Clayton et al. 1970–1982 (563). Illustration: Chippindall 1955 (fig. 311). Voucher: Zambatis 1376. PRECIS code 9901120–00650.

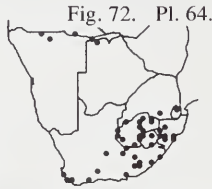
***Echinochloa pyramidalis* (Lam.) Hitchc. & Chase**

Limpopo grass.

Perennial; hydrophyte, rhizomatous, stoloniferous, and tufted; 1000–4000 mm tall. Leaf blades 80–600 mm long; 5–20 mm wide. Spikelets 2.5–4.0 mm long; 1.0–1.8 mm wide. Culms robust; ligule a fringe of hairs, may be absent in upper leaves; inflorescence (150–)200(–400) mm long; racemes simple or compound, 25–35 mm long; lower floret male; lower lemma awnless, tip acute to acuminate, 3 mm long.

Flowering December to May. Swamps and riversides, usually standing in water and may be floating. Locally common. Biome: Fynbos, Savanna, and Grassland. To tropical Africa and Madagascar. Domestic use (cereal), or pasture (natural and cultivated).

Description: Chippindall & Crook 1976 (133), Chippindall 1955 (361), Clayton et al. 1970–1982 (561). Illustration: Chippindall 1955 (fig. 310). Voucher: Smook 1882. PRECIS code 9901120–00700.



***Echinochloa stagnina* (Retz.) Beauv.**

Long-awned water grass, water grass.



Perennial and annual (rarely); hydrophyte, rhizomatous, and stoloniferous; 800–1500 mm tall. Leaf blades 100–450 mm long; 4–15 mm wide. Spikelets 4–6 mm long; 1.0–1.8 mm wide. Ligule a fringe of hairs, often absent in upper leaves; inflorescence open, 80–250 mm long; racemes 20–80 mm long, branches clearly secund; spikelets narrowly ovate, with rigid hairs on nerves; lower floret male or sterile; lower lemma with awns (1–)3–20(–50) mm long.

Flowering December to May. Growing in water, streamsides and often floating in water. Locally common. Biome: Savanna and Grassland. Tropical Africa, Madagascar, Assan to Indo-China. Pasture.

Description: Chippindall & Crook 1976 (132), Chippindall 1955 (360), Clayton et al. 1970–1982 (562). Illustration: Chippindall 1955 (fig. 311). Voucher: Jacobsen 2978. PRECIS code 9901120–00800.

***Echinochloa ugandensis* Snowden & C.E. Hubb.**

Annual; hydrophyte, stoloniferous, and tufted; 250–800 mm tall. Leaf blades 70–200 mm long; 3–6 mm wide. Spikelets 2.3–3.0 mm long; 1.5 mm wide. Ligule a fringe of hairs; inflorescence 50–200 mm long, linear with racemes neatly 4-rowed and up to 30 mm long; spikelets pubescent; lower floret sterile; lower lemma acute or with awn up to 6 mm long.



Flowering January. Swampy areas, shallow pools. Locally common. Biome: Savanna. Up to tropical east Africa.

Description: Clayton et al. 1970–1982 (561). Voucher: Smook 5337. PRECIS code 9901120–00900.

***Ehrharta* Thunb.**

Diplax Bennett, *Trochera* L. Rich.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 60–1500 mm high; woody and persistent, or herbaceous; branched above, or unbranched above. Leaf blades linear to linear-lanceolate; flat, or folded, or rolled; disarticulating from the sheaths, or not disarticulating. Ligule an unfringed membrane, or a fringed membrane, or a fringe of hairs. *Plants with hermaphrodite florets.*

Inflorescence a single raceme, or paniculate (then narrow, with slender branches); espatheate (though in two species the mature inflorescence base is enclosed in the uppermost leaf sheath). *Spikelet-bearing axes persistent.*

Spikelets solitary; not in distinct 'long-and-short' combinations; 2–17 mm long; compressed laterally, or not noticeably compressed; disarticulating above the glumes. Hairy callus absent. Glumes two; very unequal, or more or less equal; decidedly shorter than the adjacent lemmas, or long relative to the adjacent lemmas; awnless; similar (membranous). *Lower glume 5 nerved. Proximal incomplete florets* 2 (very variable in form and structure); epaleate; sterile; lemmas awned (abruptly from the back, or the lemma tapering into the awn), or awnless; less firm than the female-fertile lemmas, or similar in texture to the female-fertile lemmas.

Female-fertile florets 1. Lemmas entire; usually awnless, or mucronate (occasionally); 5–7 nerved. *Palea* present (keeled); relatively long (narrow); *thinner than the*

lemma; 1-nerved to with several nerves, or nerveless (rarely). Lodicules 2; membranous; ciliate, or glabrous. Stamens 3, or 4, or 6. Ovary glabrous. Fruit small; hilum long-linear; embryo small.

Transverse section of leaf blade. Mesophyll with arm cells (sometimes, in southern African species), or without arm cells; without fusoids. Midrib with one bundle only.

Cytology, classification, distribution. Chromosome base number, $x = 12$. Bambusoideae; Oryzodae; Ehrharteae. 27



Fig. 73. *Ehrharta capensis*

species. Southern and tropical Africa, Mascarene Is., New Zealand. Helophytic (most annuals), or mesophytic; in shade (*E. erecta*), or in open habitats; maritime-arenicolous (*E. villosa*), or glycophytic. Namibia, Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. 23 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Gibbs Russell. 1984. Bothalia 15: 145 & 149. 3. Gibbs Russell & Ellis. 1987. Bothalia 17: 51–65. 4. Gibbs Russell. 1987a. Bothalia 17: 73–67. 5. Gibbs Russell. 1987b. Bothalia 17: 191–194. 6. Gibbs Russell & Ellis. 1988. Bothalia 18: 165–171. 7. Gibbs Russell & Ellis. 1989. Bothalia 19: 189–207.

Species treatment by G.E. Gibbs Russell.

- 1(0). First sterile lemma thin, triangular, with raised nerves, less than half the length of the second sterile lemma; second sterile lemma and female-fertile lemma similar, with canoe-shaped tips 2
First sterile lemma similar in texture to second sterile lemma, with similar nervation, half as long as to equalling the second sterile lemma; female-fertile lemma differing from second sterile lemma ... 8
- 2(1). Glumes about half the length of the longest lemma 3
Glumes longer than half the length of the longest lemma 5
- 3(2). Plants delicate, herbaceous, less than 250 mm tall; inflorescences of 1–4 spikelets, barely overtopping the leaves; spikelets 4.5–5.0 mm long *E. rupestris* subsp. *dodii*
Plants not delicate, herbaceous to suffrutescent, 200–450 mm tall; inflorescences of 4–9 spikelets, considerably overtopping leaves; spikelets 4.5–6.3 mm long 4
- 4(3). Leaf blades rolled and appearing setaceous, held erect, or flat and held nearly spreading, tips not hooded; spikelets to 2 mm across, outline oblong to linear *E. rupestris* subsp. *tricostata*
Leaf blades folded, somewhat thickened, held ascending, tips hooded; spikelets to 2.5 mm across, outline oblong to nearly square *E. rupestris* subsp. *rupestris*
- 5(2). Plants erect, 250–400 mm tall; inflorescences of 5–15 spikelets; glumes appressed to florets at maturity 6
Plants sprawling, or if erect then less than 250 mm tall; inflorescences of 1–4 spikelets; glumes gaping widely at maturity 7
- 6(5). Leaf blades tightly rolled, appearing setaceous, rigid, erect or curved slightly outward from the middle, texture smooth; spikelets 5.5–6.5 mm long *E. setacea* subsp. *setacea*
Leaf blades flat, to 6 mm across at base, rolled near tip, held ascending, texture scabrous; spikelets (6.5–)7.0–8.0 mm long . *E. setacea* subsp. *scabra*
- 7(5). Plants sprawling or trailing; culms herbaceous, lowest nodes bearing leaves with blades; spikelets 4.5–6.5 mm long; glumes usually a little longer than lemmas *E. setacea* subsp. *uniflora*
Plants erect; culms suffrutescent below, lowest nodes usually leafless; spikelets 4–5 mm long; glumes slightly shorter than lemmas *E. setacea* subsp. *disticha*
- 8(1). Culms with the lowest node swollen and hard ('bulblike') 9
Culms not swollen and hard ('bulblike') at the lowest node 13
- 9(8). Sterile lemmas with a fringe of long hairs on keel; 'bulbs' fusiform, ivory coloured; basal sheaths dark purple *E. eburnea*
Sterile lemmas not fringed with long hairs; 'bulbs' spherical or cylindrical, white or orange; basal sheaths not dark purple 10
- 10(9). First sterile lemma broadest at middle, margins inrolled at basal third; glumes often less than half the length of the lemmas; first sterile lemma with strong ribs, at least on the basal half 11
First sterile lemma with margins straight from base to tip; glumes 1/2–2/3 length of the lemmas; first sterile lemma longitudinally nerved or weakly corrugated 12
- 11(10). Leaf blades flat, marginal vein pale, thickened, usually undulate; 'bulbs' taller than wide, light orange, polished, crowded; spikelets 8–12 mm long *E. capensis*
Leaf blades rolled or sometimes flat, marginal vein usually not prominent or undulate; 'bulbs' chalky white, not polished, well separated on a thin rhizome; spikelets 7–10 mm long *E. bulbosa*
- 12(10). 'Bulbs' taller than wide, dark orange, polished, crowded; spikelets 8–10 mm long . *E. ottonis*
'Bulbs' spherical, pale orange, somewhat shining, obscurely punctate; spikelets 10.0–11.5 mm long *E. longifolia*
- 13(8). Sterile lemmas lacking long hairs on sides, keel or margins, glabrous to strongly scabrous (but sometimes bearded at base) 14
Sterile lemmas with long hairs on sides, keel or margins 28
- 14(13). Sterile lemmas with tip drawn out into an awn at least 1/3 as long as body of lemma, usually equalling or longer than body of lemma ... 15
Sterile lemmas not awned (sometimes mucronate, but if mucro is as much as 1/3 as long as lemma, then lemma with long hairs on sides or keel) ... 18
- 15(14). Plants annual; basal sheaths thin and loose, not flabellate; first sterile lemma more than 2/3 length of the second; fertile floret shorter than both sterile lemmas 16
Plants tufted rhizomatous perennials; basal sheaths hard, flabellate; first sterile lemma 1/2–2/3 length of the second; fertile floret longer than body of first sterile lemma 17
- 16(15). Spikelets (7–)10–25 mm long (including awns); sterile lemmas bearded at base; sides smooth or nerved, or with 6–12 small transverse corrugations; stamens 6 *E. longiflora*
Spikelets 6–11(–14) mm long (including awns); sterile lemmas not bearded at base, sides with 4–8 strong transverse corrugations; stamens 3 *E. triandra*
- 17(15). Leaf blades expanded, 4–10 mm across, lanceolate; basal sheaths persistent, hard, reddish brown; awns 2–16 mm long *E. dura*
Leaf blades reduced, setaceous, to 1 mm across; basal sheaths eventually deciduous, membranous, light brown or whitish; awns 13–25 mm long *E. microlaena*
- 18(14). Sterile lemmas shorter than 5.5 mm (rarely to 7 mm, but then with glumes less than 3/4 the length of the lemmas) 19
Sterile lemmas longer than 5.5 mm, glumes longer than 3/4 the length of the lemmas 24
- 19(18). Glumes 1/2–3/4 the length of the lemmas; sterile lemmas with longitudinal nerves or transverse corrugations 20
Glumes nearly as long as to longer than the lemmas; sterile lemmas smooth, shining 23
- 20(19). Spikelets 2–3 mm long; glumes 2/3–3/4 the length of the lemma; second sterile lemma with an earlike appendage at base *E. delicatula*
Spikelets 3–6(–7) mm long; glumes 1/2–2/3 the length of the lemmas; second sterile lemma not appendaged at the base 21
- 21(20). Spikelets 5–7 mm long; sterile lemmas gradually tapering to an acute tip *E. erecta* var. *abysinnica*

- Spikelets less than 5 mm long; sterile lemma tips tapering or abruptly rounded 22
- 22(21). Spikelets (4.0–)4.2–5.0 mm long; sterile lemmas tapering gradually to a subacute tip; second sterile lemma often bearded at base, sides longitudinally nerved or only shallowly transversely corrugated *E. erecta* var. *natalensis*
- Spikelets 3.0–4.2 mm long; sterile lemmas abruptly rounded at tip; second sterile lemma not bearded at base, sides usually deeply transversely corrugated, especially on the distal half *E. erecta* var. *erecta*
- 23(19). Glumes 0.5–2.0 mm longer than lemmas; mountainsides in the Drakensberg *E. longigluma*
- Glumes nearly as long as to 0.5 mm longer than lemmas; dry places in the SW and NW Cape *E. melicoides*
- 24(18). Plants robust, strongly suffrutescent; leaf blades absent or reduced; sterile lemmas usually mucronate 25
- Plants not robust, usually herbaceous; leaf blades present, expanded; sterile lemmas usually mucous 26
- 25(24). Plants very robust, culms to 5 mm across; glumes usually slightly shorter than sterile lemmas; inflorescence usually contracted, pedicels erect to ascending; leaves usually bladeless *E. ramosa* subsp. *ramosa*
- Plants robust, culms to 2.5 mm across; glumes slightly to considerably longer than sterile lemmas; inflorescence usually open, pedicels spreading to reflexed; leaves rarely with small blades *E. ramosa* subsp. *aphylla*
- 26(24). Inflorescence contracted, pedicels and spikelets erect; glumes subcoriaceous *E. rehmannii* subsp. *subspicata*
- Inflorescence open, pedicels spreading to reflexed and spikelets spreading to nodding; glumes membranous 27
- 27(26). Inflorescence of fewer than 20 spikelets; leaf blades narrower than 4 mm; sterile lemmas glabrous on sides *E. rehmannii* subsp. *filiformis*
- Inflorescence of more than 20 spikelets; leaf blades to 6 mm across; sterile lemmas sometimes shortly hairy on sides or tips and/or strongly scabrous on keels *E. rehmannii* subsp. *rehmannii*
- 28(13). Second sterile lemma with ear-like appendage at base; spikelets usually less than 8.5 mm long (rarely to 11 mm) 29
- Second sterile lemma not appendaged at base; spikelets longer than 8.5 mm 32
- 29(28). First sterile lemma more than 2/3 the length of the second 30
- First sterile lemma about 1/2 the length of the second 31
- 30(29). Sterile lemmas with tips truncate or with mucro arising abruptly from central nerve; plants perennial (very rarely annual) *E. calycina*
- Sterile lemmas with tips running out gradually to mucros 1–2 mm long; plants annual *E. pusilla*
- 31(29). Sterile lemmas with tips rounded; second sterile lemma inflated; spikelets more or less terete, 2.7–3.5 mm long *E. brevifolia* var. *brevifolia*
- Sterile lemmas with tips aristate, not inflated; spikelets laterally compressed, 3.5–4.5 mm long *E. brevifolia* var. *cuspidata*
- 32(28). Sterile lemmas with hairs only on keels and margins; leaf blades hairy, flat; nodes often with a ring of retrorse hairs; rhizomes short, woody, knotted *E. barbinodis*
- Sterile lemmas with profuse hairs on sides; leaf blades glabrous, usually rolled; nodes lacking retrorse hairs; rhizomes long, no thicker than culms 33

- 33(32). Glumes 1/2–3/4 as long as the spikelet, 5-nerved, upper glume to 8 mm long; spikelets 8–10 mm long; rhizomes densely covered with hairy cataphylls, internodes often sub-bulbous *E. thunbergii*
- Glumes 3/4 as long to about equalling the spikelet, 5–9 nerved, upper glume 8–13 mm long; spikelets (10–)11–18 mm long; rhizomes naked, slender, not sub-bulbous 34
- 34(33). Inflorescence exserted from uppermost leaf sheath, the sheath usually not inflated; upper glume 9–13 mm long; culms to 3 mm across *E. villosa* var. *villosa*
- Inflorescence closely subtended or enveloped by inflated uppermost leaf sheath; upper glume (10–)13–18 mm long; culms to 5 mm across *E. villosa* var. *maxima*

Ehrharta barbinodis Nees ex Trin.

Shrub or dwarf shrub; tufted; 300–900 mm tall. Leaf blades 10–100 mm long; to 4 mm wide. Spikelets 10–13 mm long; about 3 mm wide. Culms several, branched, woody, nodes retrorsely hairy; leaf blades short; sterile lemmas similar, smooth, with hairs on keel and margins.



Flowering July to October. Rocky hillsides, often growing through bushes. Infrequent to locally common. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (679), Chippindall 1955 (44). Illustration: Chippindall 1955 (fig. 4(11) & 14). Voucher: Acocks 16439. PRECIS code 9901600–00100.

Ehrharta brevifolia Schrad. var. *brevifolia*

Erect annual; 180–300 mm tall. Leaf blades 25–90 mm long; 3–5 mm wide (flat or folded). Spikelets 2.7–3.3 mm long. Sterile lemmas similar in texture, sides long-hairy, 1st about half the length of 2nd, the 2nd with a pair of ear-like appendages at base, tip rounded, sides inflated, the spikelets therefore nearly terete.



Flowering August to October. Sandy soil of coastal Fynbos and Strandveld. Infrequent. Biome: Fynbos and Succulent Karoo. Endemic. A few specimens have sterile lemmas with apiculate tips and somewhat flattened sides, and are apparently intermediate between the two varieties. In both varieties the mature sterile lemmas sometimes have dark blotches.

Description: Stapf 1898–1900 (673), Chippindall 1955 (42). Illustration: Chippindall 1955 (fig. 4(6)). Voucher: Smith 3031. PRECIS code 9901600–00200.

Ehrharta brevifolia Schrad. var. *cuspidata* Nees

Erect annual; 200–500 mm tall. Leaf blades 25–100 mm long; 3–5 mm wide (flat or folded). Spikelets (3.2–)3.5–4.5 mm long (including arista). Sterile lemmas similar in texture, sides long-hairy, 1st about half the length of 2nd, the 2nd with a pair of ear-like appendages at base, tip aristate, sides laterally compressed, the spikelets therefore flattened.



Flowering August to November (only rarely in November). Sandy soil, hillsides and Strandveld. Infre-

quent. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (674), Chippindall 1955 (42). Voucher: Goldblatt 2279. PRECIS code 9901600–00300.

***Ehrharta bulbosa* J.E. Sm.**

Bulb or corm; long-rhizomatous and tufted; to 700 mm tall. Leaf blades 60–350 mm long; to 8 mm wide (flat or rolled, ascending). Spikelets 7–10 mm long. Lowest culm node bulbous, spherical, whitish; sterile lemmas similar in texture, transversely corrugated, the 2nd broadest at middle, inrolled below.

Flowering October to November. Hillsides and flats, alt. 50–250 m. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (666), Chippindall 1955 (38). Illustration: Chippindall 1955 (fig. 4(24)). Voucher: Manson 205. PRECIS code 9901600–00400.

***Ehrharta calycina* J.E. Sm.**

Very variable perennial, or annual (possibly); often rhizomatous; 300–700(–1800) mm tall. Leaf blades filiform or to 7 mm wide (flat or rolled). Spikelets 4.0–8.5 mm long. Sterile lemmas similar in texture, sides long-hairy, 1st more than 2/3 length of 2nd, the 2nd with tip acute, truncate or commonly with a mucro arising abruptly from the central nerve, and a pair of ear-like appendages at base.

Flowering July to June (but usually in spring). Many habitats and soil types. Common. Biome: Fynbos, Savanna, and Succulent Karoo. Endemic, but introduced to Australia as a pasture grass and naturalized there, also in California. Pasture (local strains have been tested for forage value; this species is one of the few winter-rainfall grasses even potentially valuable for grazing). This widespread and variable entity is a species complex showing polyploidy and probably aneuploidy. Many ecotypes and regional variants can be recognized. Some have been formally described, e.g. var. *angustifolia* and var. *versicolor*, but their status requires a full biosystematic study and they are therefore not treated here.

Description: Stapf 1898–1900 (674), Chippindall 1955 (42). Illustration: Chippindall 1955 (fig. 4(14) & 12). Voucher: Anderson 46. PRECIS code 9901600–00600.

***Ehrharta capensis* Thunb.**

Bulb or corm; long-rhizomatous and tufted; 400–1000 mm tall. Leaf blades 50–220 mm long; to 10 mm wide (flat, spreading, with thickened undulate marginal vein). Spikelets 8–12 mm long. Lowest culm node bulbous, cylindrical, orange, shining; sterile lemmas similar in texture, transversely corrugated, the 2nd broadest at middle, inrolled below.

Flowering September to November. Mountains and hillsides, on a variety of soils. Infrequent to locally common. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (667), Chippindall 1955 (38). Illustration: Chippindall 1955 (fig. 4(25) & 6). Voucher: Adamson 3040. PRECIS code 9901600–00700.



Fig. 74. Pl. 65.



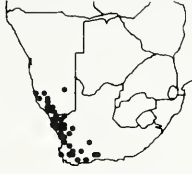
Fig. 73. Pl. 66.



Fig. 74. *Ehrharta calycina*

Ehrharta delicatula (Nees) Stapf

Leafy annual; 45–250 mm tall. Leaf blades 20–160 mm long; 1–11 mm wide (flat, thin). Spikelets 2–3 mm long. Glumes $1/2$ – $3/4$ length of lemmas; sterile lemmas similar, sides not long-hairy, with 2–3 corrugations, the 2nd sterile lemma with a pair of ear-like appendages at base.



Flowering July to October. In mesic microhabitats in arid areas: between rocks on outcrops, in shade of shrubs and in streambeds. Locally common. Biome: Fynbos, Nama-Karoo, and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (672), Chippindall 1955 (40). Illustration: Chippindall 1955 (fig. 4(9) & 10). Voucher: Goldblatt 2463. PRECIS code 9901600–00800.

Ehrharta dura Nees ex Trin.

Perennial; rhizomatous and tufted (erect, rarely long-rhizomatous); to 800 mm tall. Leaf blades 90–320 mm long; 4–10 mm wide (flat). Spikelets 9–16 mm long (excluding awns); 3 mm wide. Basal sheaths flattened, reddish brown; sterile lemmas similar, subglabrous, with awns 13–25 mm long.



Flowering September to December. Mountain Fynbos in seasonally moist open habitats, on sandstone or granite-derived soils, alt. 430–1300 m. Infrequent. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (665), Chippindall 1955 (37). Illustration: Chippindall 1955 (fig. 4(17)). Voucher: Taylor 4211. PRECIS code 9901600–01000.

Ehrharta eburnea Gibbs Russell

Bulb or corm; tufted; 200–500 mm tall. Leaf blades 40–150 mm long; to 5 mm wide. Spikelets 9–13 mm long; 3–4 mm wide. Lowest 1 or 2 culm nodes 'bulbous', fusiform, whitish, smooth; basal sheaths purple; sterile lemmas similar, smooth, with hairs on keels and margins.



Flowering September to November. Mountainsides, often in Rhenosterbosveld, alt. 1000–1400 m. Rare. Biome: Fynbos. Endemic.

Description: Gibbs Russell (1984) 145. Illustration: Gibbs Russell (1984) Fig. 9. Voucher: Acocks 15129. PRECIS code 9901600–01050.

Ehrharta erecta Lam. var. *erecta*

Perennial; loosely tufted; 200–600 mm tall. Leaf blades 30–150 mm long; 3–12 mm wide (soft). Spikelets 3.0–4.2 mm long. Glumes $1/2$ – $3/4$ length of lemmas; sterile lemmas similar in texture, sides not long-hairy, usually deeply corrugated especially on upper half, tips abruptly rounded, bases not bearded.



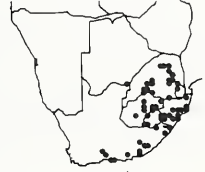
Flowering throughout the year (commonly October to January). Shady moist places, often at forest margins. Locally common. Biome: Fynbos, Savanna, and Forest. This variety is endemic; the species extends through east Africa

to India, and is also naturalized in Europe, Australia and North America. Weed. *E. erecta* is the most widespread of all ehrharts and its spikelet size and basal hairiness gradually increase northwards from the southwestern Cape. This clinal variability has traditionally been treated as three varieties.

Description: Stapf 1898–1900 (671), Chippindall 1955 (40). Illustration: Chippindall 1955 (fig. 4(19) & 9). Voucher: Adamson 760. PRECIS code 9901600–01100.

Ehrharta erecta Lam. var. *natalensis* Stapf

Perennial; loosely tufted (or rambling); to 900 mm tall. Leaf blades to 270 mm long; to 16 mm wide. Spikelets 4.2–5.0 mm long. Glumes $1/2$ – $3/4$ length of lemmas; sterile lemmas similar in texture, sides not long-hairy, longitudinally nerved or only shallowly corrugated, tapering gradually to subacute tips, the upper sterile lemma often bearded at base.



Flowering October to April (occasionally to June). Shady moist places, especially forest margins. Locally common. Biome: Savanna and Forest. Endemic. The third variety, *E. erecta* var. *abyssinica* (Hochst.) Pilg., is only doubtfully present in the Transvaal, but is the only variety that occurs in tropical Africa. It is distinguished by much larger spikelets, 5–7 mm long. Variety *natalensis* is intermediate between the other two in spikelet size and bearding on the upper sterile lemma.

Description: Stapf 1898–1900 (671), Chippindall 1955 (40). Voucher: Cleghorn 3124. PRECIS code 9901600–01200.

Ehrharta longiflora J.E. Sm.

Pl. 67.

Leafy annual; 150–600 mm tall. Leaf blades to 200 mm long; 5–15 mm wide (flat, collar often dark). Spikelets 10–25 mm long (including awns). Sterile lemmas similar, sides subglabrous, with 6–12 small corrugations, tips long-awned, bases bearded.



Flowering July to November.

Hillslopes, in the shade of rocks and shrubs, wet places, and often in disturbed areas such as roadsides, gardens. Locally common. Biome: Fynbos and Succulent Karoo. Endemic. Some specimens from Namaqualand have sterile lemmas with more deeply corrugated sides, and tend toward *E. triandra*.

Description: Stapf 1898–1900 (664), Chippindall 1955 (38). Illustration: Chippindall 1955 (fig. 4(10)). Voucher: Crook 1028. PRECIS code 9901600–01400.

Ehrharta longifolia Schrad.

Bulb or corm; rhizomatous and tufted; to 1200 mm tall. Leaf blades 70–200 mm long; to 5 mm wide (rolled, erect). Spikelets 10–12 mm long. Lowest culm node bulbous, spherical, whitish, dull; sterile lemmas similar, longitudinally veined, margins straight from base to tip.



Flowering November and December. Mountainsides, alt. 100–1800 m. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (667), Chippindall 1955 (38). Illustration: Chippindall 1955 (fig. 4(16)). Voucher: Liebenberg 4047. PRECIS code 9901600–01500.

***Ehrharta longigluma* C.E. Hubb.**

Perennial; rhizomatous (rhizomes long and slender), or tufted (erect); 300–600 mm tall. Leaf blades 25–120 mm long; 2–4 mm wide (flat). Spikelets 4.0–7.5 mm long. Glumes 0.5–2.0 mm longer than lemmas; sterile lemmas similar, glabrous, unawned, the 2nd with a pair of ear-like appendages at base.



Flowering November to March. Mountain grassland, 2300–3300 m, often in peaty soil. Infrequent. Biome: Afro-montane. Endemic. This is our only species of *Ehrharta* whose range does not include the southwestern or northwestern Cape.

Description: Chippindall 1955 (41). Illustration: Chippindall 1955 (fig. 4(1) & 11). Voucher: Killick 1478. PRECIS code 9901600–01600.

***Ehrharta melicoides* Thunb.**

Haasgras.

Perennial; rhizomatous (rhizomes stout), or tufted (densely); 300–700 mm tall. Leaf blades 50–250 mm long; to 4 mm wide (tightly rolled or sometimes flat). Spikelets 3.5–4.0 mm long. Culm bases tightly clad by thick old leaf sheaths and sometimes appearing bulbous, but the culms themselves not swollen; glumes about as long as the lemmas; sterile lemmas similar, glabrous, unawned, the 2nd with a pair of ear-like appendages at base.



Flowering August to November. Mountainsides, in Rhenosterveld and in overgrazed grassland, often in rocky places among dolerite or shale. Infrequent. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (673), Chippindall 1955 (41). Illustration: Chippindall 1955 (fig. 4(15)). Voucher: Acocks 17303. PRECIS code 9901600–01700.

***Ehrharta microlaena* Nees ex Trin.**

Perennial; tufted (erect); to 1100 mm tall. Leaf blades 70–150 mm long; to 1 mm wide (setaceous). Spikelets 13–15 mm long (excluding awns); to 2.5 mm wide. Basal sheaths pale; sterile lemmas similar, subglabrous with awns 2–14 mm long.



Flowering December to February. Mountain Fynbos at streambanks and in damp peaty places, alt. 400–1330 m. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (665), Chippindall 1955 (37). Illustration: Chippindall 1955 (fig. 4(18)). Voucher: Esterhuysen 28427. PRECIS code 9901600–01800.

***Ehrharta ottonis* Kunth ex Nees**

Bulb or corm; rhizomatous and tufted; to 1200 mm tall. Leaf blades to 600 mm long; to 5 mm wide (rolled, erect). Spikelets 8–10 mm long. Lowest culm node bulbous, cylindrical, orange, shining; sterile lemmas similar, longitudinally veined, margins straight from base to tip.



Flowering September to November. Hills and mountains, and on flats in disturbed places, alt. 50–800 m.

Infrequent to locally common. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (677), Chippindall 1955 (39). Illustration: Chippindall 1955 (fig. 4(23)). Voucher: Lamb 111. PRECIS code 9901600–01900.

***Ehrharta pusilla* Nees ex Trin.**

Sprawling annual; 50–350 mm tall. Leaf blades 15–110 mm long; 2–7 mm wide (flat or folded, sheaths often inflated). Spikelets (5.6–)6.5–8.5 mm long. Sterile lemmas similar, sides long-hairy, tips gradually running out into an arista 1–2 mm long, the 1st sterile lemma more than 2/3 length of 2nd, the 2nd with a pair of ear-like appendages at base.



Flowering July to October. Sandy soil, usually in dry streambeds. Locally common. Biome: Nama-Karoo and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (674), Chippindall 1955 (43). Illustration: Chippindall 1955 (fig. 4(8) & 13). Voucher: Goldblatt 5678. PRECIS code 9901600–02000.

***Ehrharta ramosa* (Thunb.) Thunb. subsp. *aphylla* (Schrad.) Gibbs Russell**

(=*E. aphylla* Schrad.) 1.

Shrub or dwarf shrub, or perennial (culms woody); rhizomatous (rhizomes woody, branched); 300–800 mm tall. Leaf blades to 30 mm long; to 1 mm wide (often absent). Spikelets (5.5–)6.0–7.5 (–9.0) mm long. Culms to 2.5 mm across; leaves usually bladeless, but reduced blades sometimes present; panicle usually open, pedicels spreading to reflexed; glumes usually somewhat longer than lemmas; sterile lemmas similar, sides hairless, tips usually mucronate, the 2nd sterile lemma with a pair of ear-like appendages at base.



Flowering September to January. Mountain Fynbos on TMS-derived soils, between rocks, often in dry microhabitats. Locally common. Biome: Fynbos. Endemic. Intermediates exist to subsp. *ramosa* and to subspecies of *E. rehmannii*.

Description: Stapf 1898–1900 (678), Chippindall 1955 (39). Voucher: Esterhuysen 28110. PRECIS code 9901600–02100.

Ehrharta ramosa* (Thunb.) Thunb. subsp. *ramosa

Shrub or dwarf shrub, perennial (culms woody); rhizomatous (rhizomes woody, branched); 300–1000 mm tall. Leaf blades absent. Spikelets (5.5–)6.0–7.5 (–9.0) mm long; 2–3 mm wide. Culms to 5 mm across; leaves bladeless; panicle usually contracted, pedicels erect to ascending; glumes usually slightly shorter than lemmas; sterile lemmas similar, sides hairless, tips usually mucronate, the 2nd sterile lemma with a pair of ear-like appendages at base.



Flowering October to January. Mountain or grassy Fynbos, on sandy or stony TMS or lateritic soils, often in rocky places. Locally common (at high altitudes). Biome: Fynbos. Endemic. The robust leafless culms are similar to *E. thunbergii* and *E. villosa*, but these species have profusely hairy sterile lemmas.

Description: Stapf 1898–1900 (677), Chippindall 1955 (39). Illustration: Chippindall 1955 (fig. 8). Voucher: Taylor 4235. PRECIS code 9901600–02200.

***Ehrharta rehmannii* Stapf subsp. *filiformis* (Stapf)
Gibbs Russell**

(=*E. rehmannii* Stapf var. *filiformis* Stapf) 7.

Perennial (sometimes delicate); tufted (erect or straggling, often growing in dense masses); 120–800 mm tall. Leaf blades 15–100 mm long; to 4 mm wide (usually soft and thin). Spikelets 4.0–6.5 (–8.0) mm long. Inflorescence an open raceme with 1–15 (–24) spikelets, pedicels spreading to reflexed; glumes about as long as lemmas, membranous; sterile lemmas similar, sides hairless, tips usually muticous, the 2nd sterile lemma with a pair of ear-like appendages at base.

Flowering October to February. Sandy (TMS) and humic soils, at streamsides, moist places and in shade of rocks. Infrequent. Biome: Fynbos. Endemic. Intermediates link this subspecies to the other two.

Description: Stapf 1898–1900 (677), Chippindall 1955 (39). Voucher: Acocks 22484. PRECIS code 9901600–02300.



Ehrharta rehmannii* Stapf subsp. *rehmannii

Perennial; tufted (erect); 300–1000 mm tall. Leaf blades 60–300 mm long; to 6 mm wide. Spikelets (5–)6–8 mm long; about 2 mm wide. Inflorescence an open raceme or verticillate panicle, with more than 20 spikelets; glumes about as long as lemmas, membranous; sterile lemmas similar, scabrous to shortly hairy, tips usually muticous, the 2nd sterile lemma with a pair of ear-like appendages at base.

Flowering August to December. Mountain slopes, on streambanks and rocky places, sometimes under trees. Infrequent. Endemic. A particularly tall, long-leaved form with thick but soft culms and numerous short spikelets (5.5–6.0 mm long) occurs in forests and on rocky ground at George and Knysna.

Description: Stapf 1898–1900 (677), Chippindall 1955 (39). Illustration: Chippindall 1955 (fig. 4(21)). Voucher: Compton 23076. PRECIS code 9901600–02400.



***Ehrharta rehmannii* Stapf subsp. *subspicata* (Stapf)
Gibbs Russell**

(=*E. subspicata* Stapf) 7.

Perennial; tufted (erect); 300–600 mm tall. Leaf blades 30–120 (–170) mm long; 4.0–8.5 mm wide (erect). Spikelets 6.0–8.5 mm long. Inflorescence a narrow raceme of 12–36 erect appressed spikelets; glumes about as long as lemmas, subcoriaceous; sterile lemmas similar, sides hairless, tips usually muticous, the 2nd sterile lemma with a pair of ear-like appendages at base.

Flowering October to December. Sandy or gravelly soil in moist places, near sea level. Rare. Endemic.

Description: Stapf 1898–1900 (676), Chippindall 1955 (39). Illustration: Chippindall 1955 (fig. 4(22) & 7). Voucher: Esterhuysen 33720. PRECIS code 9901600–02440.



***Ehrharta rupestris* Nees ex Trin. subsp. *dodii* (Stapf)
Gibbs Russell**

(=*E. dodii* Stapf) 2.

Delicate perennial; rhizomatous (trailing, rarely erect); less than 250 mm tall. Leaf blades rolled, erect. Spikelets 4.5–5.0 mm long; to 2 mm wide. Inflorescence a raceme of 1–4 spikelets; glumes 1/3 as long as lemmas; 1st sterile lemma short, glumelike, 2nd with a canoe-shaped tip.

Flowering November to January. Wet places on mountainsides, among rocks and at cliff bases, alt. 660–1660 m. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (670), Chippindall 1955 (35). Illustration: Chippindall 1955 (fig. 4(2)). Voucher: Esterhuysen 33084. PRECIS code 9901600–02490.



Ehrharta rupestris* Nees ex Trin. subsp. *rupestris

Suffrutescent perennial; long rhizomatous; to 300 mm tall. Leaf blades 20–30 mm long; 2–4 mm wide (folded, distichous, tips hooded). Spikelets 4.5–6.0 mm long; to 2.5 mm wide. Inflorescence a raceme of 4–8 spikelets; spikelets nearly square; glumes 1/3 as long as lemmas; 1st sterile lemma short, glumelike, 2nd with a canoe-shaped tip.

Flowering October to January. Mountain slopes among rocks, alt. 910–1970 m. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (668), Chippindall 1955 (37). Illustration: Chippindall 1955 (fig. 4(3)). Voucher: Esterhuysen 21044. PRECIS code 9901600–02500.



***Ehrharta rupestris* Nees ex Trin. subsp. *tricostata*
(Stapf) Gibbs Russell**

(=*E. tricostata* Stapf) 2.

Suffrutescent perennial; rhizomatous; 200–450 mm tall. Leaf blades to 100 mm long; to 2.5 mm wide (usually rolled, setaceous (rarely flat)). Spikelets 4.6–6.3 mm long; to 2 mm wide. Lowest leaf sheaths blade-bearing; inflorescence a raceme of 4–9 spikelets; glumes 1/3 as long as lemmas; 1st sterile lemma short, glumelike, 2nd with a canoe-shaped tip.

Flowering October to February. Wet places on mountain slopes and at base of cliffs, alt. 300–2030 m. Infrequent. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (669), Chippindall 1955 (35). Illustration: Chippindall 1955 (fig. 4(4a)). Voucher: Fourcade 3132. PRECIS code 9901600–02540.



***Ehrharta setacea* Nees subsp. *disticha* Gibbs Russell**

Delicate but suffrutescent perennial; rhizomatous (cushion-forming); to 250 mm tall. Leaf blades to 30 mm long; distichous, hard, rolled. Spikelets 4–5 mm long. Inflorescence a raceme of 1–2 spikelets; glumes slightly shorter than lemmas; 1st sterile lemma short, glumelike, 2nd with a canoe-shaped tip.



Flowering October to November. Dry rocky places on mountain slopes, alt. 580–1225 m. Rare. Biome: Fynbos. Endemic.

Description: Gibbs Russell (1984) *Bothalia* 15: 151. Voucher: Esterhuysen 31735. PRECIS code 9901600–02560.

***Ehrharta setacea* Nees subsp. *scabra* (Stapf) Gibbs Russell**

(=*E. setacea* Nees var. *scabra* Stapf) 2.



Suffrutescent perennial; long-rhizomatous and stoloniferous; 250–600 mm tall. Leaf blades 30–110 mm long; to 6 mm wide (scabrous, flat at base, rolled near tip). Spikelets (6.5–)7.0–8.0 mm long. Inflorescence a raceme of 5–15 spikelets; glumes 2/3–3/4 as long as lemmas; 1st sterile lemma short, glumelike. 2nd with a canoe-shaped tip.

Flowering October to January (sporadically to March). Mountainsides, among rocks, in seepage areas and in disturbed places, alt. 350–1212 m. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (669). Voucher: Haynes 868. PRECIS code 9901600–02580.

Ehrharta setacea* Nees subsp. *setacea

Suffrutescent perennial; long-rhizomatous; 250–400 mm tall. Leaf blades 50–80(–110) mm long; setaceous, hard, smooth. Spikelets 5.5–6.8 mm long. Lowest leaf sheaths bladeless; inflorescence a raceme of 5–15 spikelets; glumes 2/3 or more as long as lemmas; 1st sterile lemma short, glumelike, 2nd with a canoe-shaped tip.



Flowering September to December (sporadically to April). Infrequent. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (668), Chippindall 1955 (37). Illustration: Chippindall 1955 (fig. 4(4) & 5). Voucher: Esterhuysen 28669. PRECIS code 9901600–02600.

***Ehrharta setacea* Nees subsp. *uniflora* (Burch. ex Stapf) Gibbs Russell**

(=*E. uniflora* Burch. ex Stapf) 2.



Delicate perennial; rhizomatous; trailing, forming dense masses. Leaf blades 50–80 mm long; to 2 mm wide (soft, flat, not distichous). Spikelets 4.5–6.5 mm long. Inflorescence a raceme of 1–4 spikelets; glumes usually slightly longer than lemmas; 1st sterile lemma short, glumelike, 2nd with a canoe-shaped tip.

Flowering September to December (occasionally to March). Wet places and forest margins, alt. 10–500 m. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (670), Chippindall 1955 (37). Illustration: Chippindall 1955 (fig. 4(5)). Voucher: Esterhuysen 34039. PRECIS code 9901600–02620.

***Ehrharta thunbergii* Gibbs Russell**

(=*E. gigantea* Thunb.) 5;
(=*E. virgata* Launert) 5.



Perennial; long-rhizomatous and tufted (erect); to 1500 mm tall. Leaf blades 30–100 mm long; to 5 mm wide (rolled, often deciduous). Spikelets 8–10 mm long; 2–3 mm wide. Rhizomes sub-bulbous, with overlapping hairy cataphylls; glumes 6–8 mm long, translucent; sterile lemmas similar, profusely hairy.

Flowering September to December. Hillslopes in sandy or gravelly soil, occasionally in coastal sand. Infrequent to locally common. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (680), Chippindall 1955 (45). Voucher: Acocks 23393. PRECIS code 9901600–02750.

***Ehrharta triandra* Nees ex Trin.**

Leafy annual; 60–450 mm tall. Leaf blades 30–120 mm long; 2–6 mm wide (flat, thin). Spikelets 6–11(–14) mm long (including awns). Sterile lemmas similar, subglabrous, tips long-awned, bases not bearded, sides with 4–8 strong corrugations; stamens 3.



Flowering July to October. Hillsides in shade of rocks and shrubs and in wet places, sometimes in disturbed places and roadsides. Locally common. Biome: Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (663), Chippindall 1955 (37). Illustration: Chippindall 1955 (fig. 4(7)). Voucher: Goldblatt 2819. PRECIS code 9901600–02800.

***Ehrharta villosa* Schult. f. var. *maxima* Stapf**

Robust perennial; long-rhizomatous and tufted (erect); to 1500 mm tall. Leaf blades 15–130 mm long; to 8 mm wide (rolled, often deciduous). Spikelets (10–)12–18 mm long; to 4 mm wide. Culms to 5 mm across; rhizomes naked; inflorescence subtended by inflated leaf sheath; glumes 13–18 mm long; sterile lemmas similar, profusely hairy.



Flowering September to March (sporadically). Sea dunes. Rare. Locally dominant. Endemic. Erosion control.

Description: Stapf 1898–1900 (681), Chippindall 1955 (45). Illustration: Chippindall 1955 (fig. 4(12)). Voucher: Boucher 1689. PRECIS code 9901600–03200.

Ehrharta villosa* Schult. f. var. *villosa

Robust perennial; long-rhizomatous and tufted (erect); to 1500 mm tall. Leaf blades 30–130 mm long; to 8 mm wide (rolled, often deciduous). Spikelets 11–14 mm long; to 3 mm wide. Culms to 3 mm across; rhizomes naked; inflorescence exerted from uppermost leaf sheath; glumes



9–13 mm long; sterile lemmas similar, profusely hairy.

Flowering October to December. Seaside dunes, to 1 km inland. Rare. Locally dominant. Endemic. Erosion control.

Description: Stapf 1898–1900 (681), Chippindall 1955 (45). Illustration: Chippindall 1955 (fig. 4(12)). Voucher: Cleghorn 3122. PRECIS code 9901600–03300.

Eleusine Gaertn.

Annual, or perennial (the culms flattened); caespitose (or mat-forming). Culms 100–1500 mm high; herbaceous. Sheath margins free (the sheaths keeled). *Leaf blades linear*; flat, or folded. *Ligule a fringed membrane*.

Inflorescence of spike-like main branches; open, or contracted (sometimes forming a capitulum); *digitate or subdigitate (or shortly racemose, but clustered at the top of the culm)*; espatheate. Spikelet-bearing axes persistent.

Spikelets biseriate; 3.5–11 mm long; compressed laterally; disarticulating above the glumes, or not disarticulating (*E. coracana*); disarticulating between the florets (except in *E. coracana*). Glumes two; very unequal; markedly shorter than the spikelets; awnless. *Upper glume 3–5 nerved*. All florets female-fertile, or distal incomplete florets also present; proximal incomplete florets absent.

Female-fertile florets 3–15. Lemmas 3 nerved; entire; awnless to mucronate. Palea present. Lodicules 2; fleshy, or membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small (0.9–2 mm); ellipsoid to subglobose; hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C_4 ; NAD-ME (2 species); $XyMS+$. PCR sheath outlines even.

PCR sheath extensions absent. PCR cell chloroplasts with well developed grana; centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Chloridoideae; Chlorideae *sensu lato*. 9 species. Tropical and subtropical. Mesophytic, or xerophytic; in open habitats (savanna, grassland, weedy places). Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (1), naturalized species (3?).

References. 1. Phillips. 1971. Kew Bull. 27: 252. 2. Clayton et al. 1974. FTEA. 3. De Wet et al. 1984. Amer. J. Bot. 71(4): 550.

Species treatment by M. Koekemoer.

- 1(0). Spikes 2–8, alternately placed on a short axis, sometimes in a compact cluster, 15–30 mm long, 8–15 mm wide ***E. multiflora***
Spikes 2–13, digitate or subdigitate, 20–170 mm long, 3–10 mm wide 2
- 2(1). Spikes 1–4, stout, 20–30 mm long, 5–11 mm wide ***E. tristachya***
Spikes more than four, slender, 20–170 mm long, 3–6 mm wide 3
- 3(2). Spikelets 4–5 mm long, 2.0–2.5 mm wide, 3–9-flowered, disarticulating above the glumes and between the florets at maturity; grains oblong ***E. indica subsp. indica***
Spikelets 5–8 mm long, 3–4 mm wide, 2–6-flowered, not disarticulating at maturity; grains globose ***E. coracana subsp. africana***

***Eleusine coracana* (L.) Gaertn. subsp. *africana* (K.-O'Byrne) Hilu & De Wet**

(=*E. africana* K.-O'Byrne) 1;
(=*E. indica* (L.) Gaertn. subsp.
africana (K.-O'Byrne) S.M.
Phillips) 3.

African finger millet, osgras.

Annual; tufted; 210–620 mm tall. Leaf blades 220–500 mm long; 6–10 mm wide. Spikelets 5–8 mm long; 3–4 mm wide. Spikes 3–13, 60–170 mm long, 4–10 mm wide; spikelets 2–6-flowered, not disarticulating at maturity; grains globose.

Flowering October to May. Ruderal, on many soil types. Common. Biome: Fynbos, Savanna, and Grassland. Warm and temperate regions from Africa to Japan and in Australia. Food and drink (grains ground up for porridge or left to germinate for beer; eaten as a vegetable in Indonesia), or domestic use (for plaiting bracelets), or traditional medicine (internal remedy for leprosy or liver diseases), or chemicals (hydrocyanic acid), or weed (in cultivated lands and disturbed places). In east Africa, where it is cultivated as cereal, five races are distinguished on the inflorescence morphology. It also has a long historical record, for it is present in archaeological records of early African agriculture that date back 5000 years, and was introduced into India some 3000 years ago.

Description: De Wet et al. 1984, Kennedy-O'Byrne 1957 Kew Bull. 12,1 (65–72), Stapf 1898–1900 (645), Hitchcock & Chase 1950 (481), Chippindall 1955 (129), Clayton et al. 1970–1982 (260). Illustration: Chippindall 1955 (fig. 103). Voucher: Smook 5427. PRECIS code 9903310–00150.



Fig. 75. *Eleusine coracana subsp. africana*

Fig. 75. Pl. 68.



Eleusine indica (L.) Gaertn. subsp. *indica*

Osgras, goose grass.

Annual; stoloniferous and tufted; 230–400 mm tall. Leaf blades 50–350 mm long; 2.5–6.0 mm wide. Spikelets 4–5 mm long; 2–3 mm wide. Spikes slender, 20–120 mm long, 3.0–5.5 mm wide; spikelets 4–9-flowered, disarticulating above the glumes and between the florets at maturity; grains oblong.



Flowering November to February. Ruderal; on rocky or turf soils. Infrequent to locally common. Naturalized from India. Biome: Savanna and Grassland. Worldwide. Food and drink (grown occasionally as grain), or poisonous (reported from Australia and elsewhere that young plants sometimes contain hydrogen cyanide and are responsible for deaths of calves and sheep), or traditional medicine (cough remedy), or chemicals (hydrocyanic acid), or weed (serious worldwide, and a host for numerous fungi, nematodes and viruses).

Description: Kennedy-O'Byrne 1957 Kew Bull. 12, 1 (65), Stapf 1898–1900 (645), Hitchcock & Chase 1950 (481), Chippindall 1955 (129), Clayton et al. 1970–1982 (262). Illustration: Chippindall 1955 (fig. 102), Hitchcock & Chase 1950 (fig. 1027). Voucher: Stinton 8781. PRECIS code 9903310–00300.

Eleusine multiflora Rich.

Annual; tufted (culms fairly slender and ascending); 120–400 mm tall. Leaf blades 60–260 mm long; 3–6 mm wide. Spikelets 7–11 mm long. Spikes 2–8, stout, 15–25 mm long, 8–15 mm wide, alternating on a short axis.



Flowering February to April. Disturbed places in bush- or grassveld. Rare. Biome: Grassland. Tropical east Africa to Ethiopia. Weed (in cultivated lands).

Description: Chippindall 1955 (129), Clayton et al. 1970–1982 (261). Voucher: Smook 5050. PRECIS code 9903310–00400.

Eleusine tristachya (Lam.) Lam.

Goose grass.

Perennial; tufted; 70–180 mm tall. Leaf blades 50–180 mm long; 3–5 mm wide. Spikelets 4–7 mm long. Inflorescence digitate; spikes 1–4, stout, 10–25 mm long, 4–11 mm wide; spikelets 2–3-flowered.



Flowering February to April. Disturbed weedy places. Infrequent. Biome: Fynbos and Grassland. Tropical Africa, South America, eastern North America.

Description: Hitchcock & Chase 1950 (481), Chippindall 1955 (129). Voucher: Acocks 23824. PRECIS code 9903310–00500.

Elionurus Kunth ex Willd.*Callichloa* Steud., *Habrurus* Hochst.

Annual, or perennial; caespitose. Culms 100–1500 mm high; herbaceous; unbranched above. *The shoots aromatic (with a bitter taste), or not aromatic.* Leaf blades sometimes flat, or folded (tightly). *Ligule a fringed membrane (very short), or a fringe of hairs.* Plants bisexual, with bisexual

spikelets; with hermaphrodite florets. The spikelets of sexually distinct forms on the same plant; homomorphic.

Inflorescence a single raceme, or paniculate (of single 'racemes', terminal or sometimes axillary and gathered into false panicles); spatheate; not comprising 'partial inflorescences' and foliar organs. *Spikelet-bearing axes spike-like (flexuous); solitary; with substantial rachides (flattened); disarticulating at the joints.*

Fig. 76. *Elionurus muticus*

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only. Female-fertile spikelets compressed dorsiventrally; falling with the glumes. Glumes two; relatively large; very unequal, or more or less equal; awned (G1 often cuspidate to a bifid tip, the tails several mm long), or awnless; very dissimilar (the lower tougher, carinate on the edges, the keels generally glandular or with tufts of hairs; the upper membranous, lanceolate, not 2-keeled), or similar (rarely, both subulate). *Proximal incomplete florets* 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire; awnless. Palea present, or absent; when present very reduced. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. 15 species. Tropical and subtropical. Mesophytic to xerophytic; in open habitats (savanna, often on dry soils); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 2 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Leaves basal; lower glume of sessile spikelets with dense long hairs on back; inflorescence conspicuously hairy ***E. muticus***
 Leaves mostly cauline; lower glume of sessile spikelet glabrous or with a few sparse hairs on back; inflorescence with bare sessile spikelets outlined by short hairs of rachis and pedicels . ***E. tripsacoides***

***Elionurus muticus* (Spreng.) Kunth**

(=*E. argenteus* Nees) 1; (= *E. glaber* Phill.) 1; (= *E. glaber* Phill. var. *villosus* Phill.) 1; (= *E. pretoriensis* Phill.) 1.

Koperdraad, silky grass, suurpol, wildebeestegras, wire grass.

Perennial; densely tufted; 200–1200 mm tall. Leaf blades 10–150 mm long; setaceous or to 1–2 mm wide. Spikelets (sessile) 6–14 mm long (pedicellate somewhat shorter). Leaves basal; lower glume of sessile spikelets with long dense, silky, white hairs, tip bidentate.

Flowering September to May. In open grassland, especially sourveld. Common to dominant. Biome: Savanna and Grassland. Tropical and subtropical Africa and America. Indicator (of veld mismanagement), or weed (ruderal). Other superficially similar species having single spikelike inflorescences with silky white hairs include *Schizachyrium jeffreysii*, *Digitaria monodactyla* and *Anthephora argentea*.

Description: Chippindall 1955 (518), Clayton et al. 1970–1982 (837). Illustration: Chippindall 1955 (pl. 27), Clayton et al. 1970–1982 (fig. 195). Voucher: De Winter 2551. PRECIS code 9900280–00100.

***Elionurus tripsacoides* Willd.**

Perennial; tufted; 600–1500 mm tall. Leaf blades 200–300 mm long; 1–3 mm wide. Spikelets (sessile) 5–8 mm long (pedicellate shorter). Leaves mostly cauline; lower glume of sessile spikelets glabrous or with few hairs, tip entire or shortly bidentate.

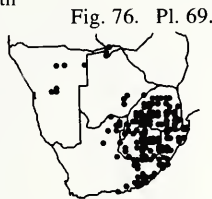


Fig. 76. Pl. 69.



Open places in savanna. Infrequent. Biome: Savanna. Tropical Africa and America. Occasionally intergrades with *E. muticus*.

Description: Clayton et al. 1970–1982 (838). Voucher: Ellis 2997. PRECIS code 9900280–00200.

***Elymandra* Stapf**

Annual, or perennial (coarse); caespitose. Culms 500–2500 mm high; herbaceous; branched above. *Ligule an unfringed membrane*. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (hermaphrodite, male-only and/or sterile); overtly heteromorphic (only the female-fertile spikelets awned).



Fig. 77. *Elymandra grallata*

Inflorescence of spike-like main branches, or paniculate (of long-exserted 'racemes' gathered into a false panicle); spatheate; a complex of 'partial inflorescences' and intervening foliar organs (the spathes and spatheoles narrow, subulate or setaceous at tips). Spikelet-bearing axes 'racemes' (elongated); paired (two per spatheole, each with 1–6 or more male-only or sterile pairs at the base, then one or more heterogamous pairs above and a heterogamous terminal triad); with substantial rachides; disarticulating at the joints.

Spikelets in triplets and in pairs (with a terminal heterogamous triad); consistently in 'long-and-short' combinations, these pedicellate/sessile (except in the upper part of the raceme, the lower homogamous pairs are all sessile). Pedicels free of the rachis. The sessile spikelets hermaphrodite (i.e., in the heterogamous combinations). The pedicellate spikelets male-only, or sterile (rarely). Female-fertile spikelets not noticeably compressed to compressed dorsiventrally; falling with the glumes. Glumes two; more or less equal; awned (G2); very dissimilar (leathery. G1

obtuse or truncate; G2 pointed or with a subule, dorsally rounded and grooved). Lower glume not two-keeled. Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes; incised; awned. Awns 1; median; from the sinus; geniculate; much longer than the body of the lemma. Palea absent. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous.

Cytology, classification, distribution. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 4 species. Tropical Africa. Mesophytic; in shade, or in open habitats (savanna woodland); glycophytic. Namibia and Botswana. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell & M. Koekemoer.

Elymandra grallata (Stapf) Clayton

Fig. 77. Pl. 70.

Perennial; tufted; 500–2000 mm tall. Leaf blades to 300 mm long; to 6 mm wide. Spikelets (sessile) 6.5–12.0 mm long (pedicellate somewhat longer). Homogamous spikelets olive-green; sessile spikelets dark brown, awns 30–50 mm long.

Flowering February to May. Sandy soil in woodland. Rare and conservation status not known. Biome: Savanna. Mozambique and north to central Africa.

Description: Clayton et al. 1970–1982 (823). Illustration: Clayton et al. 1970–1982 (fig. 189). Voucher: De Winter & Marais 4721. PRECIS code 9900801–00100.



Elytrigia Desv.

Sometimes included in *Agropyron*, *Elymus*.

Perennial; long-rhizomatous (or densely turf-forming). Culms 200–1500 mm high; herbaceous; unbranched above. Sheath margins joined (often, on vegetative shoots), or free. Leaf blades linear; flat, or rolled (convolute). Ligule an unfurled membrane. The spikelets of sexually distinct forms on the same plant (with sterile spikelets localised at the tip of the rachis), or all alike in sexuality.

Inflorescence a single spike (erect or drooping, linear); spatheate. Spikelet-bearing axes persistent.

Female-fertile spikelets solitary; distichous; 7–23 mm long; compressed laterally to not noticeably compressed; disarticulating above the glumes, or falling with the glumes. Glumes present; two; very unequal to more or less equal; decidedly shorter than the adjacent lemmas; awned, or awnless; non-carinate (or only slightly keeled towards the tip); similar (ovate, oblongate or lanceolate, not awnlike). Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 3–10 (but rarely more than 7). Lemmas similar in texture to the glumes (leathery, lanceolate); 5 nerved; entire, or incised; awnless, or mucronate, or awned. Awns when present 1; from the sinus, or apical; non-geniculate; much shorter than the body of the lemma to much longer than the body of the lemma (to 20 mm). Palea present; relatively long. Lodicules 2; membranous; ciliate. Stamens 3 (the anthers relatively long). Ovary hairy. Fruit medium sized (4–6 mm); hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Triticoideae; Triticeae. 8 species. North and south temperate. Mesophytic, or xerophytic; maritime-arenicolous, or glycophytic. Cape Province. 1 naturalized species.

Intergeneric hybrids with *Agropyron* (*X Agrotigia* Tsvelev), *Hordeum* (*X Elytrohordeum* Hylander), *Aegilops*, *Leymus* (*X Leymotrigia* Tsvelev), *Lophopyrum*, *Secale*, *Triticum* (*X Trititrigia* Tsvelev), *Thinopyrum*.

References. 1. Chippindall. 1955. Gr. & Past. 2. Dewey. 1984. Genomic classification in Gustafson, Gene manipulation: 209.

Species treatment by M. Koekemoer.

Elytrigia repens (L.) Nevski

(=*Agropyron repens* (L.) Beauv.) 1.

Fig. 78. Pl. 71.

Perennial; stoloniferous and tufted (culms erect or geniculate-ly ascending); 500–1000(–1200) mm tall. Leaf blades 150–240 mm long; 6–12 mm wide. Spikelets 10–20 mm long. Spike 100–200(–300) mm long, erect, rachis not breaking up; spikelets alternately arranged, usually overlapping, 3–8-flowered; lemmas 8–13 mm long, blunt, sharp pointed or shortly awned.

Flowering December and March. In waste places, gardens and cultivated lands. Rare. Naturalized from Europe. Biome: Fynbos and Grassland. Europe and the Mediterranean area, introduced elsewhere. Weed (of cultivation in many temperate countries).

Description: Bor 1985 (1817), Hitchcock & Chase 1950 (231). Illustration: Hitchcock & Chase 1950 (fig. 442). Voucher: Acocks 17852. PRECIS code 9904345–00300.



Fig. 78. *Elytrigia repens*

Elytrophorus P. Beauv.

Echinalysium Trin.

Annual; caespitose. Culms 100–500 mm high; herbaceous (hydrophytic). Leaf blades linear; flat. Ligule an unfringed membrane to a fringed membrane. *The spikelets of sexually distinct forms on the same plant (reduced, sterile spikelets often present at the bases of the clusters).*

Inflorescence a false spike, with clusters of spikelets on reduced axes (the glomerules sometimes confluent to form a cylinder); espatheate (but the glomerules and the clusters within them subtended by the enlarged, spreading glumes of the lower spikelets). Spikelet-bearing axes persistent. Female-fertile spikelets associated with bractiform involucres (constituted by the enlarged glumes of the lower spikelets).

Spikelets compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; markedly shorter than the spikelets, or about equalling the spikelets; awned (shortly aristulate), or awnless (muticous); similar (narrowly lanceolate, persistent, membranous). Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.

Female-fertile florets 2–6. Lemmas similar in texture to the glumes (membranous, granular, ovate); hairless (or scabrid ciliate on keel and margins); 3 nerved; entire; awned. Awns 1; median; apical (lemma becoming setaceous at the summit); non-geniculate; much shorter than the body of the lemma. Palea present; conspicuous but relatively short; 2-nerved (or more?). Lodicules 1, or 2; fleshy; glabrous. Stamens 1–3. Ovary glabrous. Fruit small; hilum short; pericarp free; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 13$. Arundinoideae; Danthonieae (?). 2–4 species. Tropical Africa, tropical Asia, Australia. Helophytic. Namibia, Botswana, and Transvaal. 2 indigenous species.

References. 1. Clayton. 1970. FTEA.

Species treatment by N.P. Barker.

- 1(0). Spikelets in globose clusters 10 mm wide and spaced from 10 to 25 mm apart; clusters of spikelets subtended by 2 to many acuminate bracts, up to 12 mm long; plants up to 500 mm tall

E. globularis

Spikelets clustered but clusters usually confluent, about 8 mm wide, subtending bracts are usually absent, but if present then shorter than spikelets; plants up to 350 mm tall **E. spicatus**

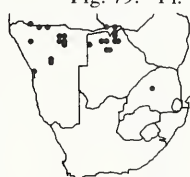
Elytrophorus globularis Hack.

Fig. 79. Pl. 72.

Annual; hydrophyte; to 500 mm tall. Leaf blades 30–500 mm long; 3–8 mm wide. Spikelets 4–7 mm long (including lemma awns). Leaves often overtopping the inflorescence; panicle narrow, interrupted, to 200 mm long; spikelets clustered into dense, globose aggregations 8–12 mm in diameter and spaced at intervals of 10–25 mm up the axis, sometimes confluent near apex; clusters subtended by 2 to many bracts, each to 12 mm long; glumes 4.5–6.0 mm long; lemmas 3.5–5.0 mm long, including stiff awn; anthers 1–3, 1.5–2.0 mm long.

Flowering October to June. Vleis, pans, in shallow water or damp places. Common. Biome: Savanna and Desert. Tropical Africa. Pasture (while soft and green).

Description: Launert 1970 (160:76), Chippindall 1955 (187), Clayton et al. 1970–1982 (135–136). Illustration: Chippindall 1955 (fig. 163). Voucher: Smith 2010. PRECIS code 9903700–00100.



Elytrophorus spicatus (Willd.) A. Camus

Annual; hydrophyte; to 350 mm tall. Leaf blades to 250 mm long; 2–4 mm wide. Spikelets 2.0–3.5 mm long (including lemma awns). Leaves generally shorter than inflorescence; panicle narrow, cylindrical, 20–250 mm long, sometimes shortly branched; spikelets not densely clustered; clusters 5–8 mm in diameter, often confluent, usually lacking subtending bracts, or when present the bracts are



Fig. 79. *Elytrophorus globularis*

shorter than the spikelets; glumes 1.5–2.5 mm long; lemmas 2.0–2.5 mm long, including slender awn; anthers 1–3, 0.3 mm long.

Flowering throughout the year. Vleis and pans. Common. Biome: Savanna. Northwards to the Congo and Tanzania, and also from Australia.

Description: Launert 1970 (160:77), Chippindall 1955 (188), Clayton et al. 1970–1982 (135). Illustration: Chippindall 1955 (fig. 162 - inflorescence only), Clayton et al. 1970–1982 (fig. 45). Voucher: Schweickerdt 2089. PRECIS code 9903700-00200.



Fig. 80. *Enneapogon cenchroides*

Enneapogon P. Beauv.

Calotheria Steud.

Annual (rarely), or perennial; caespitose. Culms (30–)50–1000(–1100) mm high; herbaceous. Leaf blades linear; flat, or rolled. *Ligule a fringe of hairs*.

Inflorescence paniculate; contracted (feathery); espathate. Spikelet-bearing axes persistent.

Spikelets 3.5–11 mm long; compressed laterally, or not noticeably compressed, or compressed dorsiventrally; disarticulating above the glumes; *not disarticulating between the florets*. Glumes two; very unequal to more or less equal; *about equalling the spikelets*; awnless; similar (membranous). *Lower glume 5–21 nerved*. Incomplete florets distal to the female-fertile florets, sterile or rudimentary, sometimes reduced to awns; *proximal incomplete florets absent*.

Female-fertile florets 1–3. Lemmas decidedly firmer than the glumes (coriaceous); 9 nerved; incised; awned. *Awns* 9; median and lateral. The median awn similar in form to the laterals; apical; non-geniculate; about as long as the body of the lemma to much longer than the body of the lemma. Palea present; relatively long (longer than the body of the lemma). Lodicules 2; fleshy, or membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C₄; NAD-ME (7 species); XyMS+. PCR sheath outlines uneven. PCR sheath extensions present. Maximum number of extension cells 1 (usually). PCR cell chloroplasts elongated; with well developed grana; centrifugal/peripheral to centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 9$ and 10. Chloridoideae; Pappophoreae. 30 species. In warm regions. Xerophytic; in open habitats (bushland and semidesert); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 7 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1970. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Awns of lemma glabrous or scabrous, not plumose; panicle open, not spikelike 2
- Awns of lemma plumose, or at least with a fringe of hairs on the margins in the lower half; panicle open or spikelike 3
- 2(1). Spikelets 4–5 mm long; plant perennial; widespread distribution ***E. scaber* var. *scaber***
- Spikelets 3 mm long; plant annual; Namibia ***E. scaber* var. (=De Winter & Hardy 8051)**
- 3(1). Plant reedlike; lower leaves with deciduous blades; restricted to limestone soils in the northeastern Transvaal ***E. sp.* (=Ellis 3208)**
- Plant not reedlike; all leaf blades persistent; distributions various 4
- 4(3). Glume tips reddish brown, often shining; culm bases erect, clad in hard shiny yellow sheaths; culms not branched ***E. pretoriensis***
- Glume tips not reddish brown, not shining; culm bases various; culms often branched above the base .. 5
- 5(4). Plant usually taller than 500 mm; leaf blades flat, wider than 3 mm; panicles branched at least in the lower half at maturity 6
- Plant usually shorter than 500 mm (but *E. scoparius* sometimes to 650 mm); leaf blades rolled, narrower than 3 mm; panicles spikelike and unbranched .. 7
- 6(5). Plant annual; panicle branches barely spreading, so the central axis is hidden; plant with dense gland-tipped hairs on leaves and culms .. ***E. cenchroides***
- Plant perennial, with a woody rootstock clad by hairy cataphylls; panicle branches spreading so the central axis is exposed; plant with sparse gland-

tipped hairs or nearly glabrous . . . *E. spathaceus* 7(5). Culms often strongly geniculate or decumbent and rooting at lower nodes; plant usually shorter than 250 mm; plant densely hairy, nodes usually with a conspicuous ring of hairs; anthers 0.2–0.7(–1.2) mm long *E. desvauxii*
Culms erect; plant usually taller than 300 mm; plant sparsely hairy, nodes lacking a conspicuous ring of hairs; anthers 1.0–2.5 mm long *E. scoparius*

***Enneapogon cenchroides* (Roem. & Schult.) C.E. Hubb.**
Fig. 80. Pl. 73.

Short-lived perennial, or annual; tufted; to 1000 mm tall. Leaf blades 30–250 mm long; 3–8 mm wide. Spikelets 3–5 mm long. Plant densely glandular-hairy; panicle branched but contracted, often dense and spikelike, central axis hidden; lemma awns hair-fringed; anthers 1.0–1.5 mm long.



Flowering throughout the year (usually in summer, but occasionally in winter in the north). Sandy soils, in disturbed places and overgrazed veld. Common. Biome: Savanna, Grassland, and Nama-Karoo. North to Sudan, through Arabia to India.

Description: Chippindall 1955 (236), Clayton et al. 1970–1982 (169). Illustration: Chippindall 1955 (fig. 211), Clayton et al. 1970–1982 (fig. 55). Voucher: De Winter & Wiss 4434. PRECIS code 9903570–00100.

***Enneapogon desvauxii* Beauv.**

(=*E. brachystachyum* (Jaub. & Spach) Stapf) 2.

Kalkgras, wondergras.

Fig. 81.



Possibly perennial, or annual; densely tufted; 30–300 mm tall. Leaf blades 25–250 mm long; filiform or to 7 mm wide. Spikelets 3.0–5.5 mm long. Plant densely glandular-hairy, nodes with a ring of hairs; culms often decumbent; panicle spike-like, dense, unbranched; lemma awns hair-fringed; anthers 0.2–0.7(–1.2) mm long.

Flowering throughout the year (usually in summer but rarely in winter in the north). Many habitats and soil types, often in overgrazed veld. Common. Biome: Savanna, Grassland, Nama-Karoo, Succulent Karoo, and Desert. Throughout Africa, and in southern Asia, Central and South America. Cleistogenes in basal leaf sheaths germinate in place so that seedlings grow out of the old plant.

Description: Chippindall 1955 (237), Clayton et al. 1970–1982 (167). Illustration: Chippindall 1955 (fig. 212). Voucher: Pole Evans 2066. PRECIS code 9903570–00200.

***Enneapogon pretoriensis* Stent**

Perennial; densely tufted; 300–650 mm tall. Leaf blades 50–250 mm long; setaceous or to 3 mm wide. Spikelets 5.5–7.0 mm long. Plant wiry, culms unbranched, bases erect, clad in hard, shiny, yellowish sheaths; panicle contracted, rarely open, branched; glume tips reddish brown, often shining; lemma awns hair-fringed; anthers 2.5 mm long.

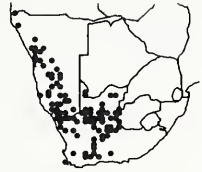


Flowering November to May. Rocky hillsides, often on northern aspect. Infrequent. Biome: Savanna and Grassland. Endemic.

Description: Chippindall 1955 (235). Illustration: Chippindall 1955 (fig. 209). Voucher: Wasserfall 23–11–1944. PRECIS code 9903570–00300.

Enneapogon scaber* Lehm. var. *scaber

Perennial; tufted; 70–350 mm tall. Leaf blades 50–115 mm long; 2–5 mm wide. Spikelets 4–5 mm long. Panicle open, branched, not spikelike; lemma awns glabrous or scabrous; anthers 0.8–1.0 mm long.



Flowering throughout the year (most commonly in summer but in winter in winter rainfall areas). Hillsides among rocks. Infrequent. Biome: Fynbos, Savanna, Nama-Karoo, Succulent Karoo, and Desert. Apparently endemic.

Description: Chippindall 1955 (235). Illustration: Chippindall 1955 (fig. 208). Voucher: Compton 23907. PRECIS code 9903570–00400.

***Enneapogon scaber* var. (=De Winter & Hardy 8051)**

Annual; to 200 mm tall (usually less). Leaf blades to 170 mm long; 4 mm wide. Spikelets 3 mm long. Differs from the typical variety in its annual habit, smaller size and shorter spikelets.



Flowering March to June. Rock crevices, gravel plains and dry sandy riverbeds. Conservation status not known. Biome: Nama-Karoo. ?Endemic.

Voucher: De Winter & Hardy 8051. PRECIS code 9903570–00450.



Fig. 81. *Enneapogon desvauxii*

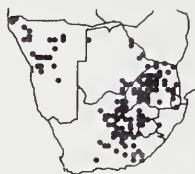
Enneapogon scoparius Stapf

(=*E. filifolius* (Pilg.) Stapf ex Garabedian) 2.

Perennial; densely tufted; 300–650 mm tall. Leaf blades 50–200(–250) mm long; filiform or to 3 mm wide. Spikelets 3.5–4.5 mm long. Plant wiry, sparsely hairy; culms erect; panicle dense, spikelike, unbranched; lemma awns hair-fringed; anthers 1.0–2.5 mm long.

Flowering throughout the year (in summer, but in winter in northern Namibia). Dry grassland and among rocks on hillsides. Common. Biome: Savanna, Grassland, Nama-Karoo, and Desert. Southern tropical Africa.

Description: Chippindall 1955 (235). Illustration: Chippindall 1955 (fig. 210). Voucher: Theron 586. PRECIS code 9903570–00500.



awnless; minutely bidentate, membranous. Incomplete distal florets 1–2, sterile, stipitate, awned; proximal incomplete florets absent.

Female-fertile florets 1, or 2 (L2 male or with a hermaphrodite floret). Lemmas decidedly firmer than the glumes (coriaceous, rigid); 3 nerved; entire, or incised; awned. Awns 1; median; from the sinus, or apical; non-geniculate; about as long as the body of the lemma to much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; ellipsoid; hilum short; pericarp fused; embryo small to large (up to 1/3 of the grain length).

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions present, or absent. Maximum number of extension cells when present 1–2. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 6 species. Africa, Seychelles, India, Formosa, Australia, Pacific. Mesophytic to xerophytic; in shade, or in open

Enneapogon spathaceus Goossens

Perennial; short-rhizomatous and tufted (rootstock with hairy cataphylls); 650–900 mm tall. Leaf blades to 200 mm long; 3–4 mm wide. Spikelets 6–7 mm long. Plant with sparse gland-tipped hairs or nearly glabrous; panicle open, branched, central axis exposed; lemma awns hair-fringed; anthers 2.5 mm long.

Flowering November to March. Sandveld. Conservation status not known. Biome: Savanna. Endemic. Possibly a hybrid between *Enneapogon cenchroides* and *Schmidtia pappophoroides*, because of its intermediate characters and restricted distribution.

Description: Chippindall 1955 (235). Voucher: Fisher & Schweickerdt 543. PRECIS code 9903570–00600.



Enneapogon sp. (=Ellis 3208)

Perennial; tufted; 550–1100 mm tall. Leaf blades to 170 mm long; 3–4 mm wide. Spikelets 5.5–6.5 mm long. Plant reed-like, culms stiffly erect; leaf blades deciduous from lower nodes; panicle open, branched, but narrow; lemma awns hair-fringed.

Flowering January to February. Restricted to soil overlying Malvernian limestone formation. Rare. Biome: Savanna. ?Endemic, possibly also in Zimbabwe. Vegetatively very similar to *E. spathaceus* but remarkable because of its distinctive height and habit.

Voucher: Ellis 3208. PRECIS code 9903570–99999.



Enteropogon Nees

Macrostachya A. Rich.

Perennial; caespitose. Culms 200–1200 mm high; herbaceous. Leaf blades linear; flat, or rolled (then involute-filiform). Ligule a fringed membrane (short).

Inflorescence a single spike, or of spike-like main branches, or a single raceme (with short pedicels); digitate or subdigitate (often), or non-digitate; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; sessile to subsessile; 5–8 mm long; compressed dorsiventrally; disarticulating above the glumes; disarticulating between the florets. Glumes two (hyaline); very unequal; long relative to the adjacent lemmas (i.e., the longer glumes); awned (G2, often), or



Fig. 82. *Enteropogon macrostachyus*

habitats (savanna on sand or clay); glycophytic. Namibia, Botswana, Transvaal, and Natal. 4 indigenous species.

References. 1. Clayton et al. 1974. FTEA. 2. Clayton. Kew Bull. 1967. 21: 105.

Species treatment by M. Koekemoer.

- 1(0). Spikelets 4–6-flowered; plants annual; spikes digitate, 4–9, 40–120 mm long; lemmas 3–5 mm long, ciliate on margins only; awn 7–25 mm long ***E. prieurii***
Spikelets 2–3-flowered; plants perennial; spikes solitary (rarely two), 60–200 mm long; lemmas 4.5–10.0 mm long, scabrid; awn 1–18 mm long . 2
2(1). Leaf sheaths strongly keeled, margins ciliate; awn of lowest lemma 2.5–8.0 mm long ***E. monostachyos***
Leaf sheaths not keeled, margins glabrous; awn of lowest lemma 1–18 mm long 3
3(2). Awn of lowest lemma 10–18 mm long ***E. macrostachyus***
Awn of lowest lemma 1–5 mm long . . . ***E. rupestris***

***Enteropogon macrostachyus* (A. Rich.) Benth.**

Fig. 82. Pl. 74.

(=*E. simplex* (Schumach. & Thonn.) A. Chev.) 1.

Perennial; tufted; 500–1200 mm tall. Leaf blades 100–600 mm long; 3–7 mm wide. Spikelets 8–10 mm long. Spikelets 3-flowered; lemma of lower floret 7–10 mm long, awn 10–18 mm long.

Flowering November to June. Disturbed places or light shade under trees. Locally common. Biome: Savanna. Tropical Africa. Similar to *E. rupestris*, which has much shorter lemma awns.

Description: Chippindall & Crook 1976 (233), Clayton 1967 (105), Clayton et al. 1970–1982 (332). Voucher: Dinter 5702. PRECIS code 9903000–00100.

***Enteropogon monostachyos* (Vahl) K. Schum. subsp. *africanus* Clayton**

Perennial; tufted; 400–1000 mm tall. Leaf blades 150–300 mm long; 2–4 mm wide. Basal leaf sheaths laterally flattened and strongly keeled; lemma of lower floret 6–8 mm long with an awn 2.5–8.0 mm long.

Flowering November to April. Grey granite flats and sandy soil near rivers, often in the shade. Locally common. Biome: Savanna. Southern tropical Africa. Related to *E. macrostachyus* and *E. rupestris*, which have leaf sheaths rounded and margins glabrous.

Description: Clayton 1967 (105), Clayton et al. 1970–1982 (333). Voucher: Ward 3666. PRECIS code 9903000–00200.

***Enteropogon prieurii* (Kunth) Clayton**

(=*Chloris prieurii* Kunth) 2.

Annual; tufted; 200–500 mm tall. Leaf blades to 300 mm long; 2–5 mm wide. Spikelets 3–5 mm long. Spikes 2–8, 50–80(–120) mm long; spikelets 4–6-flowered, 4–6-awned; lemma awn 7–10 mm long.

Flowering February. Deep white sand on palm flats. Rare (in Namibia). Biome: Savanna. Tropical Africa to Arabia. Very different from other species in this genus, which have solitary spikes, are perennial and have spikelets 2–3-flowered. This species resembles *Chloris* superficially, from which it is distinguished by dorsally compressed lemma and a different grain shape.

Description: Hitchcock & Chase 1950 (504), Clayton et al. 1970–1982 (342). Voucher: De Winter & Marais 4724. PRECIS code 9903000–00300.

***Enteropogon rupestris* (J.A. Schmidt) A. Chev.**

Bushy perennial; tufted; 500–1000 mm tall. Leaf blades 50–250 mm long. Spikelets 4–8 mm long. Culms branched; spikelets mostly 2-flowered; lemma of lowest floret 4.5–8.0 mm long with awn 1–5 mm long.

Flowering March to May. Black clay or humiferous loam, among rocks and often on north-facing slopes. Locally common. Biome: Savanna. Central Africa, Cape Verde Islands. Similar to *E. macrostachyus*, which has much longer lemma awns.

Description: Clayton 1967 (105), Clayton et al. 1970–1982 (332). Voucher: Giess & Loutit 14142. PRECIS code 9903000–00400.

Entolasia Stapf

Perennial; long-rhizomatous, or caespitose. Culms 200–1200 mm high (sometimes straggling/climbing); woody and persistent (wiry, bushy), or herbaceous; branched above, or unbranched above. *Ligule a fringe of hairs*.

Inflorescence of spike-like main branches, or paniculate (but usually with sessile spiciform racemes, appressed to the common axis); open, or contracted; spatheate. *Spikelet-bearing axes persistent*.

Spikelets solitary, or in pairs; *second*; consistently in 'long-and-short' combinations (rarely), or not in distinct 'long-and-short' combinations. *Spikelets* 2.5–6 mm long; *adaxial*; usually *compressed dorsiventrally*; falling with the glumes. Glumes present; two; very unequal; awnless; very dissimilar (lower tiny, hyaline; upper membranous, equalling the spikelet). *Proximal incomplete florets* 1; epaleate; sterile.

Female-fertile florets 1. *Lemmas* similar in texture to the glumes, or decidedly firmer than the glumes (membranous to coriaceous); smooth to striate; not becoming indurated; *hairy* (*densely silky-hairy*); having the margins tucked in onto the palea; with a clear germination flap; 3–5 nerved; entire; awnless. Palea present (hairy between the keels); relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Panicoideae; Panicoideae; Paniceae. 5 species. Tropical Africa, eastern Australia. Helophytic, mesophytic, and xerophytic; in shade and in open habitats (marshy places, damp grassland and dry forest); glycophytic. Namibia, Botswana, and Transvaal. 2 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by H.M. Anderson.

- 1(0). Spikelets 2.2–2.5 mm long; leaves linear-lanceolate ***E. olivacea***
Spikelets 4.5–6.5 mm long; leaves linear ***E. imbricata***



Fig. 83. *Entolasia imbricata****Entolasia imbricata* Stapf**

Perennial; tufted; to 1500 mm tall. Leaf blades to 500 mm long; 2–8 mm wide. Spikelets 4.5–6.5 mm long; 1.5 mm wide. Culms erect, simple and stout at base; leaf blades linear, tapering to an acute point; inflorescence 100–450 mm long; spikelets pale straw-coloured; upper glume 5 mm long.

Flowering January to March. Flood plain, seasonally flooded to one meter. Infrequent. Biome: Savanna. Tropical Africa.

Description: Clayton et al. 1970–1982 (573). Voucher: P.A. Smith 1876. PRECIS code 9901021–00100.

Fig. 83. Pl. 75.

***Entolasia olivacea* Stapf**

Perennial; rhizomatous; to 1000 mm tall. Leaf blades 50–100 mm long; 5–15 mm wide. Spikelets 2.2–2.5 mm long; 1 mm wide. Culms erect, geniculate and branched; leaf blades linear-lanceolate, constricted at base, point acutely acuminate; inflorescence 70–150 mm long; spikelets dull green colour; upper glume 2.5 mm long.

Flowering January to March. In shade, moist places. Infrequent. Biome: Savanna. Tropical Africa.

Description: Clayton et al. 1970–1982 (573). Voucher: Johannsmeier 372. PRECIS code 9901021–00300.

***Entoplocamia* Stapf**

Annual (robust). Culms (200–)400–1100 mm high; herbaceous; unbranched above. Leaf blades linear-lanceolate; flat, or rolled. Ligule a fringe of hairs.

Inflorescence a single spike, or a single raceme, or paniculate; contracted (the spikelets solitary or in clusters or secondary spikes on the rachis of a simple or compound spike); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 9–20 mm long; compressed laterally (becoming twisted when mature); falling with the glumes; not disarticulating between the florets (the spikelets falling whole). Glumes two; very unequal to more or less equal; markedly shorter than the spikelets; awnless; similar (thin, membranous, ovate). Incomplete florets *both distal and proximal to the female-fertile florets*; distal incomplete florets merely underdeveloped; proximal incomplete florets 2.

Fig. 84. *Entoplocamia aristulata*

Female-fertile florets 4–20. Lemmas decidedly firmer than the glumes (cartilaginous at the base, chartaceous above, hyaline at the margins); without a germination flap; 9–11 nerved; entire; mucronate to awned. Awns 1; median; apical (the midnerve excurrent into a short, stout mucro or awn); much shorter than the body of the lemma. Palea present; relatively long. Stamens 3. Ovary glabrous. Fruit small (2 mm); ellipsoid; hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 1 species. Angola, southwest and southern Africa. Xerophytic (but often grows in depressions where moisture collects); in open habitats; halophytic (sometimes), or glycophytic (usually). Namibia. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.

Entoplocamia aristulata (Hack. & Rendle) Stapf

Fig. 84. Pl. 76.

Robust annual; tufted; (200–)400–1100 mm tall. Leaf blades 75–150 mm long; 2–3 mm wide. Spikelets 9–17 mm long. Spikelets robust, spiny, laterally compressed, sometimes twisted, often in glomerate racemes on a central axis; lemma 9–11-nerved, chartaceous, with a short, spiny, deflexed awn.



Flowering February to May. Rocky outcrops or open plains on brackish or calcareous soil. Infrequent (but occasionally in dense stands in moist depressions). Biome: Savanna, Nama-Karoo, and Desert. Angola.

Description: Stapf 1898–1900 (711), Chippindall 1955 (189). Illustration: Chippindall 1955 (fig. 165). Voucher: Du Toit 258. PRECIS code 9903280–00100.

Eragrostis N. M. Wolf

Boriskerella Terekhov, *Erochloe* Raf., *Erosion* Lunell, *Exagrostis* Steud., *Neeragrostis* Nicora, *Macroblepharus* Philippi, *Psilantha* (K. Koch) Tzvelev, *Roshevitzia* Tsvelev, *Triphlebia* Stapf, *Vilfagrostis* Doell.

Annual, or perennial; caespitose (sometimes shrubby), or decumbent. Culms 100–3000 mm high; herbaceous (usually), or woody and persistent (occasionally); branched above, or unbranched above. Leaf blades linear; flat, or folded, or rolled; not disarticulating. Ligule a fringed membrane to a fringe of hairs.

Inflorescence a false spike, with clusters of spikelets on reduced axes (occasionally), or paniculate (often glandular, characteristically scented); open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 1–25 mm long; compressed laterally (usually strongly so), or not noticeably compressed (rarely—Section *Cylindrostachya*); usually disarticulating above the glumes, or falling with the glumes (in some species); not disarticulating between the florets (with persistent paleas), or disarticulating between the florets. Glumes two (persistent or deciduous); very unequal, or more or less equal; markedly shorter than the spikelets; decidedly shorter than the adjacent lemmas; awnless; similar (membranous). Upper glume 1 nerved. All florets female-fertile, or with distal incomplete florets also present; proximal incomplete florets nearly always absent (a very few species with 1–3 incomplete lower florets).

Female-fertile florets 2 (rarely), or 3–45. Lemmas similar in texture to the glumes, or decidedly firmer than



Fig. 85. *Eragrostis curvula*

the glumes (narrow, membranous to papery); *hairless* (*usually glabrous*); without a germination flap; 1–3 nerved; entire, or incised; awnless, or mucronate (very rarely almost awned). Palea present (often persistent); relatively long (but shorter than the lemma), or conspicuous but relatively short. Lodicules when present 2; fleshy; glabrous. Stamens 1–3. Ovary glabrous. Fruit small; hilum short; pericarp usually fused (but rather readily detachable in some species), or free (e.g. in *E. megalosperma*, *E. stapfiana*); embryo large.

Photosynthetic pathway and related features. C_4 (with the startling exception of *E. walteri*: see Ellis 1984); NAD-ME (14 species); XyMS+. PCR sheath outlines uneven, or even, or uneven to even. PCR sheath extensions present, or absent. PCR cell chloroplasts ovoid, or elongated; with well developed grana; centrifugal/peripheral, or centripetal, or centrifugal/peripheral to centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 350 species. Cosmopolitan, mostly subtropical. Helophytic, or mesophytic, or xerophytic; mostly in open habitats (often on poor soils or disturbed ground); maritime-arenicolous, or halophytic, or glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (79), naturalized species (4).

References. 1. De Winter in Chippindall. 1955. Gr. & Past. 2. De Winter. 1960. Bothalia 7: 387. 3. De Winter. 1961. Bothalia 7: 467. 4. De Winter. 1961. Kirkia 1: 100. 5. De Winter. 1966. Bothalia 9: 137. 6. De Winter. 1969. Bothalia 10: 72. 7. Launert. 1970. FSWA. 8. Gordon-Gray. 1972. Fl. Natal. 9. Clayton et al. 1974. FTEA. 10. Phillips. 1982. Kew Bull. 37:133.

Species treatment by L. Smook.

- 1(0). Spikelets disarticulating below the glumes and falling entire as a unit 2
 - Spikelets breaking up in various places above the glumes at maturity 3
- 2(1). Plants perennial; palea wings broad and entire; lemma narrowly ovate in profile *E. superba*
 - Plants annual; palea wings very broad and usually lacerate; lemma lanceolate in profile *E. pilgeriana*
- 3(1). Lemma deeply trilobed at the apex, with a median awn 0.8–1.5 mm long and the lateral nerves excurrent into a short distinct mucro or awn *E. aristata*
 - Lemma entire or shallowly lobed at the apex, with or without a median awn, lateral nerves not excurrent into minute mucros or awns 4
- 4(3). Palea keels with hairs 0.3–1.3 mm long for most of its length which are usually exerted beyond the lemma (note: long hairs are found at the base of the palea keels in *E. capensis* and *E. cimicina* but these are not exerted) 5
 - Palea keels glabrous or scabrid, or ciliate with hairs shorter than 0.3 mm and not exerted beyond the lemma 10
- 5(4). Rachilla persistent, the lemmas and/or paleas breaking up from the base upwards; plants perennial 6
 - Rachilla fragile, the lemmas, paleas and part of the rachilla internode breaking off as units from the apex downwards; plants annual 7
- 6(5). Lemma with lateral nerves and sometimes the keel with hairs 0.3–1.2 mm long *E. lappula*
 - Lemma with lateral nerves and keel glabrous or with hairs less than 0.3 mm long *E. hierniana*
- 7(5). Lemma keel (at least in the upper lemmas of a spikelet) with stiff hairs 0.2–0.4 mm long, especially towards the base *E. ciliaris*
 - Lemma keel smooth, scabrid or scaberulous 8
- 8(7). Inflorescence contracted, dense, branches appressed to the main axis; spikelets crowded; anthers 0.3–0.4 mm long *E. arenicola*
 - Inflorescence open, branches spreading; spikelets distant; anthers to 0.3 mm long 9
- 9(8). Inflorescence usually dense with many spikelets and with sticky glands (noticeable due to particles adhering to the glandular area) *E. viscosa*
 - Inflorescence not dense, with fewer spikelets, eglandular or with non-sticky glands *E. tenella*
- 10(4). Vegetative parts of plants with swollen-tipped glandular hairs 11
 - Vegetative parts of plants lacking swollen-tipped glandular hairs 12
- 11(10). Spikelets 1.5–2.5 mm wide; anthers 0.6–1.0 mm long; pedicels slender, flexible and with an annular gland *E. annulata*
 - Spikelets 1.0–1.5 mm wide; anthers 0.2 mm long; pedicels stout, rigid, lacking annular glands *E. pygmaea*
- 12(10). Lemma with distinct elongated dark patches on or next to the lateral nerves *E. caesia*
 - Lemma without distinct elongated dark patches, or these only occasionally scattered on the lemmas but not confined to the lateral nerves 13
- 13(12). Spikelets to 2.1 mm wide 14
 - Spikelets 2.2 mm and wider 95
- 14(13). Inflorescence consisting of 2–8 dense globose to ovoid clusters of spikelets distant from each other along the main axis; spikelets elliptic to narrowly oblong *E. congesta*
 - Inflorescence not as above, if spikelets in clusters these clusters coalescent with only the lower clusters sometimes distant 15
- 15(14). Culms with sticky glandular patches below the nodes and on the leaf sheaths below the collar (noticeable due to particles adhering to the glandular areas) *E. gummiflua*
 - Culms and sheaths eglandular or with non-sticky glandular patches 16
- 16(15). Plants annual 17
 - Plants perennial 45
- 17(16). Anthers to 0.5 mm long 18
 - Anthers 0.6–1.5 mm long 40
- 18(17). Spikelets sessile, in wedge-shaped clusters, these coalescent into a spikelike inflorescence *E. patens*
 - Spikelets pedicellate or sessile, distant or crowded, or clustered but the clusters not wedge-shaped; inflorescence open or contracted 19
- 19(18). Rachilla fragile, spikelets breaking up from the apex downwards 20
 - Rachilla persistent or the upper part of the rachilla eventually becoming fragile, spikelets with lemmas and/or paleas breaking up from the base upwards (persistent in *E. tef*) 21
- 20(19). Lemma obtuse to truncate; caryopsis subglobose *E. aspera*
 - Lemma acute to acuminate; caryopsis ovate-elliptic *E. leersiiformis*
- 21(19). Anthers 2 *E. gangetica*
 - Anthers 3 22
- 22(21). Spikelets to 1.2 mm wide 23
 - Spikelets 1.3–2.1 mm wide 33
- 23(22). Lowest lemma 2.0–2.7 mm long 24
 - Lowest lemma 0.5–1.9 mm long 25
- 24(23). Upper glume 1/2–2/3 the length of the lemma directly above in the intact spikelet *E. tef*
 - Upper glume barely reaching or just covering the base of the lemma directly above in the intact spikelet *E. tenuifolia*
- 25(23). Spikelets narrowly elliptic when young to broadly ovate at maturity; 1–2(–3) florets per spikelet *E. biflora*
 - Spikelets oblong, linear to lanceolate; usually with more than 3 florets per spikelet 26

- 26(25). Lower glume to 1/3 the length of the lemma above in the intact spikelet, weakly keeled and loosely folded 27
 Lower glume 1/3 the length to as long as the lemma above in the intact spikelet, strongly keeled and tightly folded 31
- 27(26). Lemmas on the same side of the rachilla barely reaching the lemma above in the intact spikelet *E. remotiflora*
 Lemmas on the same side of the rachilla distinctly overlapping the lemma above in the intact spikelet 28
- 28(27). Lower lemma 1.8 mm and longer ... *E. tenuifolia*
 Lower lemma to 1.7 mm long 29
- 29(28). Inflorescence robust, spikelets irregular and densely condensed along the primary branches, these either spreading or appressed to the main axis, branches stout and rigid; lemmas ovate-elliptic *E. homomalla*
 Inflorescence delicate, loose with spikelets distant, branches slender, usually flexible; lemmas broadly ovate 30
- 30(29). Lowest lemma 0.7–1.0 mm long, lateral veins indistinct; lemmas hardly diminishing in length towards the apex of the spikelet; inflorescence branches not bearded in the axils ... *E. aethiopica*
 Lowest lemma 1.0–1.6 mm long, lateral veins distinct; lemmas conspicuously becoming shorter towards the apex of the spikelet; inflorescence branches bearded in the axils *E. pilosa*
- 31(26). Caryopsis subglobose; basal leaf sheaths densely covered for the whole length with bulbous-based hairs *E. pygmaea*
 Caryopsis oblong-elliptic; basal leaf sheaths glabrous or with a few scattered bulbous-based hairs 32
- 32(31). Leaf blade with margins smooth, with raised glands; leaf blade with midrib with glandular dots *E. kingesii*
 Leaf blade with margins scabrid, eglandular; leaf blade with midrib eglandular *E. virescens*
- 33(22). Caryopsis subglobose 34
 Caryopsis oblong to elliptic 35
- 34(33). Lowest lemma 1.7–2.8 mm long, obtuse *E. cilianensis*
 Lowest lemma 1.0–1.6 mm long, acute *E. pygmaea*
- 35(33). Upper glume barely reaching or just covering the base of the lemma directly above in the intact spikelet *E. tenuifolia*
 Upper glume 1/3–2/3 the length of the lemma directly above in the intact spikelet 36
- 36(35). Inflorescence branches usually more than 40 mm long, flexible, pedicels slender *E. tef*
 Inflorescence branches usually less than 40 mm long, rigid, pedicels usually stout 37
- 37(36). Lemma acute 38
 Lemma obtuse 39
- 38(37). Inflorescence sparsely branched, with a few spikelets not too densely crowded; lowest lemma 1.4–1.6(–1.8) mm long; spikelets 1.0–1.5(–1.8) mm wide *E. kingesii*
 Inflorescence much branched, with many spikelets densely crowded; lowest lemma (1.8–)2.0–2.5 mm long; spikelets (1.7–)2.0–2.5 mm wide *E. procumbens*
- 39(37). Glumes unequal; leaf blade margins scabrid *E. barrelieri*
 Glumes subequal; leaf blade margins with raised glands *E. minor*
- 40(17). Lateral nerves of lemma with glandular dots *E. laevis*
 Lateral nerves of lemma without glandular dots 41
- 41(40). Lemma very broadly ovate to almost oblate, glossy, coriaceous, with a broad, clear membranous margin in the upper part *E. membranacea*
- Lemma broadly elliptic or oblong to lanceolate, dull, chartaceous to membranous, without a distinctly different upper margin 42
- 42(41). Lowest lemma 1.8–2.7 mm long ... *E. omahekensis*
 Lowest lemma to 1.7 mm long 43
- 43(42). Lowest lemma obovate-elliptic, 1.0–1.5 mm long, apex truncate to broadly rounded ... *E. porosa*
 Lowest lemma broadly elliptic to broadly oblong-ovate, 1.5–1.7 mm long, apex obtuse to subacute 44
- 44(43). Lateral nerves of lemma obscure; palea oblanceolate to narrowly obovate, margins touching or overlapping at the apex *E. cylindriflora*
 Lateral nerves of lemma prominent; palea obovate, margins close but not touching or overlapping at the apex *E. glandulosipedata*
- 45(16). Inflorescence with spikelets directly on the main axis or with branches closely appressed to the main axis or spreading but then sparsely branched with only primary branches or very short secondary branches and spikelets appressed to the branches 46
 Inflorescence moderately to much branched, branches spreading, spikelets usually spreading 62
- 46(45). Spikelets reddish brown; anthers 2 ... *E. chapelieri*
 Spikelets various shades and combinations of green, grey, purple or red; anthers 3 47
- 47(46). Culms wiry and matted 48
 Culms not as above 49
- 48(47). Glumes acuminate; lemmas lanceolate in profile, lateral nerves distinct *E. walteri*
 Glumes obtuse; lemmas broadly ovate in profile, lateral nerves indistinct *E. volkensii*
- 49(47). Lateral nerves of lemma reaching to the upper margins and usually excurrent into minute mucros, small glandular dots present; caryopsis subglobose *E. crassinervis*
 Lateral nerves of lemma not reaching to the upper margins, not excurrent into mucros, eglandular; caryopsis ovate, elliptic to oblong 50
- 50(49). Plants densely tufted; leaves mainly basal 51
 Plants loosely tufted or creeping; leaves mainly cauline 58
- 51(50). Palea keels flat, usually 0.1 mm or wider 52
 Palea keels a raised ridge or narrow line to 0.1 mm wide 53
- 52(51). Plants robust, culms 2–4 mm wide; lowest lemma 1.4–2.0 mm long, broadly obtuse ... *E. pallens*
 Plants slender, culms to 2 mm wide; lowest lemma 2–3 mm long, acute to acuminate ... *E. nindensis*
- 53(51). Glumes membranous to chartaceous 54
 Glumes cartilaginous 55
- 54(53). Lemmas on the same side of the rachilla overlapping the lemma above up to just over 1/2; spikelets linear to oblong *E. curvula*
 Lemmas on the same side of the rachilla overlapping the lemma above by 2/3 or more; spikelets lanceolate to narrowly ovate *E. stenothyrsa*
- 55(53). Upper glume lanceolate-oblong; lateral nerves of lemma distinct *E. elatior*
 Upper glume ovate, boat-shaped; lateral nerves of lemma indistinct 56
- 56(55). Basal sheaths glabrous or thinly hairy with pale, silky hairs *E. racemosa*
 Basal sheaths with dense yellowish woolly hairs 57
- 57(56). Inflorescence branches spreading from the main axis *E. sclerantha* subsp. *sclerantha*
 Inflorescence branches erect and appressed to the main axis *E. sclerantha* subsp. *villosipes*
- 58(50). Upper glume tapering into a long, thick-textured acuminate, awn-like apex *E. walteri*
 Upper glume acute or obtuse to broadly obtuse, not awn-like 59

- 59(58). Anthers 0.2–0.3 mm long; lowest lemma 1.5(–1.7) mm long **E. sarmentosa**
 Anthers 0.6–1.3 mm long; lowest lemma 1.6–3.0 mm long 60
- 60(59). Inflorescence usually shorter than 40 mm; spikelets with lemmas conspicuously diminishing in length towards the apex **E. sabulosa**
 Inflorescence usually 50 mm or longer; spikelets with lemmas hardly diminishing in length towards the apex 61
- 61(60). Inflorescence slender, unbranched or sparsely branched; spikelets solitary on main axis or 2–6 per branch closely appressed to the main axis, spikelets or branches distant, not overlapping each other **E. elatior**
 Inflorescence robust, moderately branched; spikelets more than 6 per branch, branches appressed to main axis, and overlapping each other **E. inamoena**
- 62(45). Spikelets very broadly ovate **E. habrantha**
 Spikelets linear to oblong, to ovate or elliptic . 63
- 63(62). Lower glume to 1/3 the length of the lemma above in intact spikelet, upper glume barely reaching to just overlapping the base of the lemma above 64
 Characters not occurring in the above combination 65
- 64(63). Lateral lemma nerves with glandular dots; plants robust **E. plana**
 Lateral lemma nerves eglandular; plants slender **E. tenuifolia**
- 65(63). Palea keels thickened, either broad or flat or a prominent ridge along the entire length 66
 Palea keels thickened into a narrow line or obscure and apparently the palea folded only, without any thickening, occasionally keels slightly wider towards the base 68
- 66(65). Palea obovate, usually protruding from the lemma; lateral nerves of lemma indistinct or a faint line; spikelets glossy, rachilla fragile; plants lacking a creeping rhizome **E. pallens**
 Palea oblanceolate to narrowly obovate; lateral nerves of the lemma distinct; spikelets dull, rachilla persistent; plants with creeping rhizomes 67
- 67(66). Palea narrowly obovate, membranous except for the keels, apex usually truncate to obtuse **E. inamoena**
 Palea oblanceolate, thick-textured, apex acute to subacute **E. patentissima**
- 68(65). Palea margins not meeting or overlapping except occasionally at the base 69
 Palea margins meeting or overlapping along their entire lengths or at the apex only 77
- 69(68). Basal sheaths densely covered with woolly hairs **E. sclerantha** subsp. **sclerantha**
 Basal sheaths glabrous or with scattered hairs, or densely hairy at the very base only, hairs not woolly 70
- 70(69). Spikelets narrowly elliptic . **E. pseudosclerantha**
 Spikelets linear-oblong 71
- 71(70). Culm nodes (those nodes without branches) hairy 72
 Culm nodes (those nodes without branches) glabrous 73
- 72(71). Plants sprawling, stoloniferous and rooting at the nodes; leaf blades 2–6 mm wide **E. barbinodis**
 Plants geniculate or straight, but erect, not sprawling, not stoloniferous or rooting at the nodes; leaf blades 1.5–2.0 mm wide **E. lehmanniana** var. **chaunantha**
- 73(71). Pedicels with an annular gland **E. moggii** var. **moggii**
 Pedicels eglandular or with glandular patches or dots, but no annular gland 74
- 74(73). Basal sheaths with nerves very close together at the base, forming prominent squarish ridges usually with long hairs in the deep furrows between the nerves **E. curvula**
 Basal sheaths with the nerves wide apart at the base, forming obscure or roundish ridges with shallow furrows or furrows absent, glabrous or only hairy at the very base 75
- 75(74). Leaf blades usually 3–5 mm wide, narrowing abruptly into a long, thin apex, curling when dry **E. rigidior**
 Leaf blades usually to 3 mm wide, narrowing gradually to the apex, not curling when dry . 76
- 76(75). Inflorescence with lowest branches whorled, and with long hairs in the axils; spikelets untidy and whitish in appearance because the apical margins of the lemmas and glumes are whitish, membranous and usually torn . **E. trichophora**
 Inflorescence with lowest branches not whorled and the axils glabrous; spikelets appearing tidy because the glumes and lemmas are firm around the apices . **E. lehmanniana** var. **lehmanniana**
- 77(68). Inflorescences with lowest branches whorled, pseudo-whorled or clustered around the main axis 78
 Inflorescences with lowest branches not arranged as above 87
- 78(77). Basal sheaths densely hairy at the base 79
 Basal sheaths glabrous or obscurely hairy 82
- 79(78). Lemmas greyish green to near the apex, then yellowish grading into white at the margins, often flushed purple below the yellow; inflorescence branches (excluding main axis) thickly covered with minute prickles **E. rotifer**
 Lemmas variously coloured, the apex the same colour as the rest of the lemma, or white with the yellowish patch absent; inflorescence branches smooth, or if scabrid then the prickles large and not densely packed 80
- 80(79). Plants slender, wiry; culms usually much branched and geniculate, often rooting at the nodes; collar of leaf sheath often with round, usually purple glandular dots; glumes as long as the lemmas directly above, lower glume wide and covering most of the lemma above in the intact spikelet **E. trichophora**
 Plants robust, culms usually unbranched, occasionally geniculate, not rooting at the nodes; collar of leaf sheath often lacking round glandular dots; glumes variable in length, lower glume usually not so broad that it covers most of the lemma above in the intact spikelet 81
- 81(80). Culms easily compressed; leaf blades usually 4–10 mm wide, flat **E. jeffreysii**
 Culms not easily compressed; leaf blades to 3 mm wide, usually rolled or appearing setaceous **E. curvula**
- 82(78). Lemma strongly keeled, keel prominent and obvious for the entire length of the lemma . 83
 Lemma not strongly keeled, keel obscure or only prominent in the upper part of the lemma . . 85
- 83(82). Inflorescence effuse, much branched, the shortest pedicel of the spikelet pair as long as or longer than the spikelet; spikelets spreading on the branches **E. micrantha**
 Inflorescence moderately branched; shortest pedicel of spikelet pair shorter than the spikelet; spikelets condensed on the branches 84
- 84(83). Spikelets to 1.5 mm wide; leaf blades 2–3 mm wide; plants moderately slender; lower glume translucent, smooth or scabrid only on the keel or at the apex **E. heteromera**
 Spikelets 1.5–2.5 mm wide; leaf blades 5–10 mm wide; plants robust; lower glume opaque for most of its surface, rough **E. acraea**
- 85(82). Lower glume 4/5 to slightly longer than the lemma above in the intact spikelet; leaf sheaths at the collar with small round glandular dots, usually

- flushed purple; leaves mainly cauline, narrowing abruptly to a point at the apex; plants erect, culms usually branched and geniculate **E. trichophora**
- Lower glume to 3/4 the length of the lemma above in the intact spikelet; leaf sheaths at the collar without small round glandular dots; leaves mainly a dense basal tuft 86
- 86(85). Plants tall, robust; spikelets 5–11-flowered **E. planiculmis**
- Plants short to moderately tall; spikelets 2–3(–5)-flowered **E. stapfii**
- 87(77). Lemma nerves with small glandular dots, which often give the nerves a lumpy appearance **E. laevisissima**
- Lemma nerves without glandular dots 88
- 88(87). Lemma bicoloured, usually deep purple to violet, yellowish at the apex with whitish margins, occasionally pallid with yellow; rhizome oblique **E. bicolor**
- Characters not present in the above combination 89
- 89(88). Leaf blades 5–10 mm wide; glumes opaque, usually rough **E. acraea**
- Leaf blades to 4.5 mm wide; glumes translucent, usually smooth, occasionally scabrous towards the apex 90
- 90(89). Inflorescence 25–80 mm long; leaf blades only slightly tapered to the apex; culm nodes usually with long spreading white hairs; plants stoloniferous and often rooting at the nodes **E. sabinae**
- Inflorescence usually longer than 80 mm, if shorter, leaf blades tapering into a very long filiform apex; culm nodes glabrous; plants not stoloniferous or rooting at the nodes 91
- 91(90). Basal sheaths hairy for quite a way up from the base, with long hairs especially in the deep furrows between the prominent ridges formed by the nerves; inflorescence extremely variable **E. curvula**
- Basal sheaths glabrous or obscurely hairy or densely hairy only at the extreme base, furrows shallow or absent between the nerves 92
- 92(91). Plant base with culms not densely compacted, easily separable to individual culms 93
- Plant base with culms strongly and densely compacted, not easily separable into individual culms 94
- 93(92). Weak perennial; inflorescence effuse, spikelets spreading from each other and from the branches **E. micrantha**
- Moderately strong perennial; inflorescence open, spikelets appressed to the branchlets and close to one another **E. heteromera**
- 94(92). Leaf blades straight or drooping; spikelets linear **E. planiculmis**
- Leaf blades very curly; spikelets narrowly obovate **E. chloromelas**
- 95(13). Basal sheaths with long, dense, woolly hairs at the base (these sometimes only visible on the inner sheaths) 96
- Basal sheaths glabrous or hairy but not with long woolly hairs, or hairy only at the extreme base of the sheaths 98
- 96(95). Spikelets dark olive-green; lemma apex acute, lateral nerves conspicuous; rachilla persistent **E. scleranthera subsp. scleranthera**
- Spikelets pallid to dark purple; lemma apex broadly obtuse to broadly truncate, lateral nerves conspicuous, rachilla fragile 97
- 97(96). Lowest lemma truncate **E. truncata**
- Lowest lemma broadly obtuse **E. bergiana**
- 98(95). Plants annual 99
- Plants perennial 107
- 99(98). Upper glume barely reaching the base of the lemma above in the intact spikelet **E. tenuifolia**
- Upper glume 1/4 as long to longer than the lemma above in the intact spikelet 100
- 100(99). Lemma narrowly to broadly obtuse in profile 101
- Lemma acute to acuminate in profile 103
- 101(100). Spikelets glossy; lemma margins differing in texture from the rest of the lemma, being clear, thinly membranous and often torn **E. membranacea**
- Spikelets dull; lemma margins of similar texture to the rest of the lemma 102
- 102(101). Spikelets ovate to very broadly oblong, rachilla fragile, breaking up from the apex downwards; anthers 1.0–1.2 mm long; caryopsis obovate **E. brizantha**
- Spikelets narrowly ovate to narrowly oblong, rachilla persistent, lemmas and/or paleas breaking up from the base upwards, rachilla often breaking off above the glumes before all the lemmas have fallen; anthers 0.2–0.3 mm long; caryopsis subglobose **E. cilianensis**
- 103(100). Lemma acuminate in profile, often awned **E. dinteri**
- Lemma acute in profile, unawned, but a mucro present or absent 104
- 104(103). Inflorescence with the branches slightly spreading and the spikelets few and distant **E. rogersii**
- Inflorescence with the branches usually appressed to the main axis, occasionally spreading in the lower part and the spikelets many and densely crowded 105
- 105(104). Glumes longer than the lemmas directly above them in the intact spikelet **E. macrochlamys var. macrochlamys**
- Glumes shorter to as long as the lemmas directly above them in the intact spikelet 106
- 106(105). Spikelets oblong to elliptic, rachilla usually persistent or breaking off above the glumes before all the lemmas have fallen; lemmas and/or paleas breaking up from the base upwards **E. procumbens**
- Spikelets broadly oblong to broadly ovate, rachilla fragile; lemmas and/or paleas breaking up from the apex downwards **E. macrochlamys var. wilmaniae**
- 107(98). Palea keels with lower portion very broad and projecting from the rest of the keel (Fig. 91) 108
- Palea keels of variable width, entire, the widest part not projecting from the rest of the keel 109
- 108(107). Palea keels with lower broad portion ending in a deep notch at the top; palea apex acute **E. echinochloidea**
- Palea keels with lower broad portion rounded or only shallowly notched at the top; palea apex rounded **E. x pseud-obtusa**
- 109(107). Lemma with lateral nerves indistinct 110
- Lemma with lateral nerves clearly distinct 114
- 110(109). Culms straggling and matted; cauline leaves usually becoming reflexed **E. volkensii**
- Culms erect or sometimes geniculate but not matted or straggling; cauline leaves never reflexed 111
- 111(110). Lower glume lanceolate 112
- Lower glume ovate 113
- 112(111). Plants 500–800 mm tall, not sprawling, dense basal tuft of leaves absent; inflorescence 80–100 mm long **E. pseudoscleranthera**
- Plants 300–400 mm tall, sprawling, dense basal tuft of leaves present; inflorescence to 75 mm long **E. lamprospicula**

- 113(111). Rachilla persistent, lemmas and/or paleas breaking up from the base upwards; palea keels with a narrow thickened ridge, not winged *E. racemosa*
Rachilla fragile, spikelets breaking up from the apex downwards; palea keels broad and winged *E. nindensis*
- 114(109). Lemma obtuse to subobtuse or rounded ... 115
Lemma acuminate, acute to subacute, or truncate to concave between the keel and the lateral nerves which reach the margin 118
- 115(114). Palea broadly elliptic to round; rachilla very fragile *E. obtusa*
Palea ovate, elliptic to obovate; rachilla persistent, or sometimes with the upper portion fragile 116
- 116(115). Spikelets with the opposite rows of the florets hardly overlapping at their bases, rachilla usually visible between the florets; leaves mainly cauline, culms often branched in the upper parts *E. scopelophila*
Spikelets with opposite rows of florets closely packed and overlapping at the bases, rachilla not visible; leaves mainly basal 117
- 117(116). Lemma dull, granular; palea narrowly obovate, membranous to subcartilaginous between the margin and keel, margins close together at the base becoming farther apart towards the apex *E. capensis*
Lemma shiny; palea elliptic, thickly cartilaginous especially between the margins and the keels, margins nearly meeting along the entire length of the palea *E. cimicina*
- 118(114). Inflorescence with most pedicels more than 3 times the length of the spikelets *E. patetissima*
Inflorescence with most pedicels (excluding the terminal ones) shorter than or just as long as the spikelets 119
- 119(118). Palea margins almost meeting to overlapping along the entire length of the palea 120
Palea margins far apart for most of the length of the palea 122
- 120(119). Inflorescence slender, sparsely branched, spikelets either solitary or 2–6 clustered together and distant along the main axis *E. elatior*
Inflorescence open or contracted but then the branches overlapping; moderately to well branched 121
- 121(120). Palea long and narrow, margins touching along their entire length and overlapping at the apex, keels a thin obscure line; spikelets 5–7-flowered; leaf blades 5–10 mm wide *E. acraea*
Palea narrowly obovate, margins slightly apart or just touching along the entire length, keels narrow but distinct; spikelets 7–40-flowered; leaf blades 2–4 mm wide *E. inamoena*
- 122(119). Palea keels narrow, rounded . *E. scopelophila*
Palea keels broad and flattened 123
- 123(122). Palea keels very wide in lower 2/3, distinctly narrowing in the upper 1/3, excurrent to a soft mucro at the apex *E. walteri*
Palea keels the same width throughout or only slightly narrower at the apex 124
- 124(123). Anthers 3; lemma with lateral nerves raised and prominent, excurrent into minute mucros, usually gland-dotted; caryopsis subglobose *E. crassinervis*
Anthers 2; lemma with lateral nerves usually not raised and prominent, not excurrent into minute mucros, eglandular; caryopsis broadly ellipsoid *E. chapelieri*

Eragrostis acraea De Winter

Robust perennial; densely tufted; to 2000 mm tall. Leaf blades 200–300(–600) mm long; 5–10 mm wide. Spikelets 5–7 mm long; 1.5–2.5 mm wide. Basal sheaths glabrous or obscurely hairy at the base; inflorescence moderately branched, spreading or contracted, spikelets condensed on the branches, most pedicels shorter than the spikelets; spikelets oblong to oblong-elliptic, 5–7-flowered, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes usually rough, opaque; lemma acute to subacute, strongly keeled, keel prominent for the entire length of the lemma, lateral nerves prominent; palea long and narrow, keels a thin line, entire, scabrid to smooth, margins touching along the entire length and overlapping at the apex; anthers 3, 1.2–1.7 mm long, caryopsis oblong-elliptic.



Flowering November to April. Mountainous areas, often between rocks and in disturbed places. Locally common. Biome: Grassland and Savanna. Zimbabwe. Domestic use (temporary thatching that does not last), or pasture (grazed when young, unpalatable when old, green in winter).

Description: De Winter 1961 (100). Chippindall & Crook 1976 (151). Voucher: Codd & Dyer 9074. PRECIS code 9902860–00100.

Eragrostis aethiopica Chiov.

Annual; loosely tufted (erect); to 600 mm tall. Leaf blades 30–200 mm long; 1–3 mm wide. Spikelets 1.7–5.0 mm long; 0.7–1.0 mm wide. Inflorescence delicate, loose, branches and pedicels slender and flexible, axils of the branches not bearded, the spikelets distant; spikelets linear to oblong, lemmas on the same side of the rachilla overlapping the lemma above and hardly diminishing in length towards the apex of the spikelet, rachilla persistent, the lemmas and/or paleas breaking up from the base upwards; lower glume to 1/3 the length of the lemma above in the intact spikelet, weakly keeled; lemma broadly ovate with lateral veins not visible, lowest lemma 0.7–1.0 mm long; palea keels usually smooth; anthers 3, 0.1–0.2 mm long; caryopsis ellipsoid.



Flowering January to May. Damp sand or black clay in small vleis, pan edges and riverbeds. Biome: Savanna. Northwards to east Africa and Ethiopia. Resembles *E. pilosa*, which has the lemmas conspicuously shorter towards the apex of the spikelet, and *E. remotiflora*, in which the lemmas on the same side of the rachilla do not overlap the base of the lemma above it.

Description: De Winter in Chippindall 1955 (153), Clayton et al. 1970–1982 (215). Voucher: Theron 2955. PRECIS code 9902860–00200.

Eragrostis annulata Rendle ex Scott Elliot

Annual; tufted; to 350 mm tall. Leaf blades 50–100 mm long; to 3 mm wide. Spikelets 5–15 mm long; 1.5–2.5 mm wide. Vegetative parts with glandular hairs with swollen tips; inflorescence open with spikelets spreading, pedicels long, flexible and with a single annular gland; spikelets with the upper part of the rachilla fragile and the lower part persistent; lemma and palea keels glabrous or scabrid; anthers 3, 0.6–1.0 mm long; caryopsis broadly oblong to broadly ovate.



Flowering February to May. On a variety of soils, especially sandy or stony ground and calcareous soil where the water table is high, and in disturbed areas. Locally common. Biome: Savanna, Nama-Karoo, and Desert. Angola. Resembles *E. cilianensis*, which lacks swollen-tipped glandular hairs and has a subglobose caryopsis.

Description: Stapf 1898–1900 (619), De Winter in Chippindall 1955 (178). Illustration: De Winter in Chippindall 1955 (fig. 150). Voucher: Acocks 12639; Theron 1967. PRECIS code 9902860–00300.

Eragrostis arenicola C.E. Hubb.

Annual; loosely tufted (erect); to 350 mm tall. Leaf blades to 100 mm long; to 4 mm wide. Spikelets 2–4 mm long; 1.0–1.8 mm wide. Inflorescence contracted, dense, branches appressed to the main axis, spikelets close to one another, glands if present not sticky; spikelets with rachilla fragile, lemmas and/or paleas breaking up from the apex downwards; lemma keels smooth or scaberrulous; palea keels with hairs 0.3–0.6 mm long, which are exerted from the lemma; anthers 2–3 (number variable in the same inflorescence), 0.3–0.4 mm long.

Flowering April. Sandy soil in disturbed areas such as cultivated lands and roadsides. Infrequent (in FSA area). Biome: Savanna. Throughout tropical Africa but mainly in the south. Weed (of cultivated lands). Centre of a cluster of closely related species including *E. tenella*, which has the inflorescence open with the spikelets spreading, *E. ciliaris*, which has the lemmas with long stiff hairs on the keels, and *E. viscosa*, which has sticky glands on the inflorescence.

Description: Chippindall & Crook 1976 (149), Clayton et al. 1970–1982 (207). Voucher: Scheepers 630. PRECIS code 9902860–00400.

Eragrostis aristata De Winter

Annual; tufted (erect and geniculate); to 750 mm tall. Leaf blades to 200 mm long (possibly longer); to 6.5 mm wide. Spikelets to 6 mm long; 1.5–3 mm wide (excluding awns). Spikelet rachilla persistent at first, becoming fragile, lemmas and/or paleas breaking up from the base upwards; lemma deeply two-lobed at the apex with the central awn 0.8–1.5 mm long, the lateral nerves shortly awned or sometimes mucronate; palea keels scabrid; anthers 3, 0.6–0.8 mm long; caryopsis oblong.

Flowering August, and April to May. Moist places. Locally common (Brandberg and Unjab mouth in Namibia). Biome: Nama-Karoo and Desert. Endemic.

Description: De Winter 1961 (468). Voucher: Oliver, Muller & Steenkamp 6688. PRECIS code 9902860–00500.

Eragrostis aspera (Jacq.) Nees

Grootpluimeragrostis.

Annual; tufted (erect); to 800 mm tall. Leaf blades to 300 mm long; to 10 mm wide. Spikelets 3–10 mm long; 1.0–1.5 mm wide. Inflorescence open, branches ascending at 45 degree angles, bearded in the axils, pedicels long and slender; spikelet rachilla fragile, lemmas and/or paleas breaking up from the apex downwards; lemma obtuse to truncate; palea keels scabrid; anthers 3, 0.2–0.3 mm long; caryopsis subglobose.

Flowering February to June. On sandy soil in dolomite areas and in disturbed places and old cultivated areas. Locally common. Biome: Savanna. Tropical Africa and India. Similar to *E. leersiiformis*, which has an ovate-elliptic caryopsis.

Description: Chippindall & Crook 1976 (7), Stapf 1898–1900 (628), De Winter in Chippindall 1955 (160), Clayton et al. 1970–1982 (209). Illustration: De Winter in Chippindall 1955 (fig. 128). Voucher: Killick 1714. PRECIS code 9902860–00600.

Eragrostis barbinodis Hack.

Perennial; stoloniferous and tufted; culms to 1000 mm long, geniculate to decumbent, often rooting at the nodes. Leaf blades 100(–150) mm long; 2–6 mm wide. Spikelets to 7 mm long; 1.2–1.5 mm wide. Culm nodes (without branches at the nodes) with long spreading hairs; inflorescence open, branches spreading, lowest branches not whorled; spikelets linear to oblong, rachilla persistent, sometimes becoming fragile, lemmas and/or paleas breaking up from the base upwards; glumes 1/2–3/4 the length of the lemmas directly above in the intact spikelet; palea margins wide apart, not touching, keels a narrow line, scaberrulous; anthers 3, 0.8–1.0 mm long.

Flowering December to May. Red sandy loam, gritty to sandy soils and black turf. Locally common. Biome: Savanna. Introduced to east Africa as a forage grass. Hybridizes with *E. rigidior*, which is more erect and has the unbranched nodes glabrous.

Description: Stapf 1898–1900 (621), De Winter in Chippindall 1955 (147). Voucher: Smook 4454. PRECIS code 9902860–00800.

Eragrostis barrelieri Dav.

Annual; laxly tufted (erect to geniculate); to 300 mm tall. Leaf blades to 100 mm long; to 3.5 mm wide. Spikelets 5–15 mm long; 1.5–1.8 mm wide. Inflorescence open, primary branches usually not longer than 40 mm, spreading, pedicels stout; spikelet rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes unequal; lemma obtuse; palea keels scabrid; anthers 3, 0.2–0.3 mm long; caryopsis oblong-elliptic.

Flowering December to January. On sand in disturbed areas such as road verges and in gardens. Locally common. Naturalized and invader from southern Europe. Biome: Savanna and Grassland. North Africa through the Middle East to India, and southern Europe. Weed. Similar to *E. cilianensis*, which has a subglobose caryopsis and wider spikelets, and *E. minor*, which has subequal glumes.

Description: Hitchcock & Chase 1950 (156), De Winter in Chippindall 1955 (158), Clayton et al. 1970–1982 (239). Illustration: De Winter in Chippindall 1955 (fig. 125). Voucher: De Winter 267. PRECIS code 9902860–00900.

Eragrostis bergiana (Kunth) Trin.

Kalkkweek.

Mat-forming perennial; long rhizomatous and tufted; to 400 mm tall. Leaf blades 4–8 mm long; 1.0–1.5 mm wide. Spikelets 4–8 mm long; 2.2–3.8 mm wide. Basal sheaths with dense, long, woolly hairs; inflorescence

sparsely branched, spikelets densely clustered on the side branches, which are slightly spreading from the main axis; spikelets completely pallid or flushed with dark purple, rachilla fragile, lemmas and/or paleas breaking up from the apex downwards; lowest lemma broadly obtuse, lateral nerves conspicuous; palea scaberulous; anthers 3, 1.5 mm long.

Flowering September, December, and February. Limestone soils, especially in pans and eroded places. Locally common. Biome: Nama-Karoo. Drought and frost resistant pasture and erosion control (soil binder). Barely distinguishable from *E. truncata* and a detailed study is needed in this group. Resembles *E. annulata*, which has glandular hairs with swollen tips and a broadly oblong to broadly ovate caryopsis, and *E. barrelieri* and *E. minor*, which have oblong caryopsis and narrower spikelets.

Description: Stapf 1898–1900 (624), De Winter in Chippindall 1955 (178). Illustration: De Winter in Chippindall 1955 (fig. 149). Voucher: Smook 3923. PRECIS code 9902860–01000.

Eragrostis bicolor Nees

Fyn vleigras.

Perennial; usually hydrophyte, or tufted (densely), or rhizomatous (rhizome oblique); to 600 mm tall. Leaf blades to 200 mm long; to 1.5 mm wide. Spikelets to 8 mm long; 1–2 mm wide. Leaves mainly basal, flat, usually glaucous; inflorescence open, lax, branches and spikelets spreading, lowest branches solitary or 2–3, not whorled; spikelets linear to narrowly oblong, rachilla persistent or upper part fragile and florets breaking off in groups; glumes $1/2$ – $2/3$ the length of the lemmas above them in the intact spikelet; lemmas deep purple or violet with a yellowish apex, sometimes mostly yellowish but always bicoloured; palea margins very close for the entire length, just touching to overlapping at the apex, keels a thin line, entire, smooth or scaberulous; anthers 3, 0.8–1.2 mm long.

Flowering October to May. Often in brack areas, in water or on wet soil around seasonal pans, and in dry riverbeds. Locally common. Biome: Savanna and Nama-Karoo. Zimbabwe. Pasture (grazed by game).

Description: Stapf 1898–1900 (605), De Winter in Chippindall 1955 (141). Illustration: De Winter in Chippindall 1955 (fig. 109). Voucher: Smook 3385, Bryant 645a. PRECIS code 9902860–01100.

Eragrostis biflora Hack. ex Schinz

Annual; tufted; to 700 mm tall. Leaf blades to 300 mm long; to 8 mm wide. Spikelets 1.5–2.5 mm long; 0.5–1.2 mm wide. Inflorescence open, delicate, much branched, pedicels long and slender; spikelets narrowly elliptic when young to broadly ovate when mature, with 1–2(–3) florets, rachilla persistent, becoming fragile in the upper part, lemmas and/or paleas breaking up from the base upwards; lemma 1.0–1.5 mm long; palea keels glabrous to scabrid; anthers 3, 0.2–0.3 mm long.

Flowering September to May. Moist disturbed areas, especially under trees. Locally common. Biome: Savanna, Grassland, and Nama-Karoo. Endemic. Weed. Can be confused with the genus *Sporobolus*, which has 1-flowered spikelets, and resembles *E. habrantha*, which is perennial.

Description: Stapf 1898–1900 (610), De Winter in Chippindall 1955 (151). Illustration: De Winter in Chippindall 1955 (fig. 118). Voucher: Ellis 2617. PRECIS code 9902860–01200.

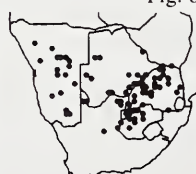


Fig. 86. *Eragrostis biflora*

Eragrostis brizantha Nees

Annual; tufted (erect to geniculate); to 500 mm tall. Leaf blades to 150 mm long; to 4.5 mm wide. Spikelets to 5 mm long; 2.2–4.0 mm wide. Basal sheaths glabrous or with long scattered hairs; inflorescence with spikelets densely crowded on slightly spreading to spreading branches; spikelets ovate to very broadly oblong, with rachilla fragile and breaking up from the apex downwards; upper glume $2/3$ – $3/4$ the length of the lemma above in the intact spikelet; lemma dull, of the same texture throughout, often flushed with purple, broadly obtuse (in profile), lateral nerves distinct with small glandular dots; palea keels entire, glabrous, with small glandular dots; anthers 3, 1.0–1.2 mm long; caryopsis obovate.

Flowering February to May (also July to November). Sandy and calcareous soils around rivers and in disturbed areas. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Resembles *E. echinochoidea*, which has the lower glume acuminate and the palea keels very broad and protruding in the lower part and ending in a deep notch on top.



Description: Stapf 1898–1900 (626), De Winter in Chippindall 1955 (174). Illustration: De Winter in Chippindall 1955 (fig. 146). Voucher: Giess & Mueller 12268. PRECIS code 9902860–01300.

***Eragrostis caesia* Stapf**

Perennial; densely tufted; 450–600 mm tall. Leaf blades to 200 mm long; to 3 mm wide. Spikelets 4–7 mm long; 1.5–2.4 mm wide. Inflorescence dense and contracted, branches usually appressed to the main axis, occasionally spreading; spikelets tardily breaking up between the florets; lemma with distinct elongated black patches along the lateral nerves; palea keels with hairs less than 0.1 mm long; anthers 3, 1.0–1.3 mm long.

Flowering November to June. Moist areas on shallow soil, Cave sandstone, and seepage areas in mountainous grassland. Locally common. Biome: Grassland and Afromontane. Zimbabwe. Eagerly grazed pasture (remains green in winter).

Description: Stapf 1898–1900 (599), De Winter in Chippindall 1955 (141). Voucher: Smook 1060, Schmitz 4167A. PRECIS code 9902860–01400.

***Eragrostis capensis* (Thunb.) Trin.**

Hartjie-eragrostis.

Perennial; tufted; to 900 mm tall. Leaf blades 70–350 mm long; 2–5 mm wide. Spikelets 3.5–15.0 mm long; 3–7 mm wide. Basal sheaths glabrous to hairy but not woolly-hairy at the base; leaves mainly basal; inflorescence sparsely branched or unbranched, spikelets appressed to the main axis or branches; spikelets plump, with the opposite row of florets overlapping and closely packed with the rachilla not visible, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lemma obtuse to subobtuse, dull and granular, greenish to greenish brown, strongly flushed with purple, lateral nerves distinct; palea narrowly obovate, keels entire, membranous to subcartilaginous between the keel and the margins, margins nearly touching to touching in the lower parts to widely separated in the upper parts; anthers 3, 1–2 mm long; caryopsis elliptic.

Flowering September to April. Sandy to clayey soils in moist areas on slopes, rocky and disturbed places. Widely common (especially after fire). Biome: Savanna, Grassland, and Fynbos. Northwards to Zaire, Kenya and Tanzania, Madagascar and Thailand. Only useful as early spring pasture. Similar to *E. ciliaris*, which has smooth and shiny lemmas and the palea margins nearly touching to touching along the entire length. Sometimes confused with *E. superba*, in which the spikelets are strongly flattened and the entire spikelet disarticulates as a unit below the glumes.

Description: Chippindall & Crook 1976 (51), Clayton et al. 1970–1982 (221). Illustration: De Winter in Chippindall 1955 (fig. 140). Voucher: Kluge 1119, Balsinhas 3201, Smook 2077. PRECIS code 9902860–01500.

***Eragrostis chapelieri* (Kunth) Nees**

Bruinsaadgras.

Perennial; erect and densely tufted; to 900 mm tall. Leaf blades to 400 mm long; to 5 mm wide. Spikelets 6–24 mm long; 2.0–2.5 mm wide. Basal sheaths glabrous to obscurely hairy at the base; inflorescence narrow, dense, bran-

ches appressed to the main axis and overlapping but often distant in the lower part; spikelets usually reddish brown, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lemma acute-acuminate, lateral nerves distinct but not raised; palea nearly the same width between the keel and the margins throughout, narrowing upwards and running into the keel near the apex, margins not touching, at least not in the upper part, keels entire, broad and flattened; anthers 2, 0.3–0.7 mm long; caryopsis broadly ellipsoid.



Fig. 87. *Eragrostis capensis*

Flowering March to August. Poor sandy soils or occasionally on clays, in disturbed areas such as old lands and pathsides. Rare (in southern Africa). Locally common. Biome: Savanna. Tropical Africa to Sudan and in Madagascar. Weed (in cultivated lands). Similar to *E. patens*, which is annual, and *E. elatior*, which has 2–6 dark olive green spikelets in clusters distant from one another on the main axis, and *E. inamoena*, which has the palea margins slightly apart to touching along the entire length and spikelets greyish-green, often flushed with purple.

Description: Chippindall & Crook 1976 (157), Stapf 1898–1900 (614), Clayton et al. 1970–1982 (225). Illustration: De Winter in Chippindall 1955 (fig. 142). Voucher: Codd 5456. PRECIS code 9902860–01600.

Eragrostis chloromelas Steud.

Perennial; tufted; to 800 mm tall. Leaf blades to 300 mm long; setaceous. Spikelets 4–6 mm long; 1.0–1.5 mm wide. Culms strongly compacted and not easily separated individually, nodes glabrous; basal sheaths glabrous or obscurely hairy at the very base; leaf blades tapering to very long filiform tips, very curly especially when older; inflorescence open and much branched, branches and pedicels spreading, long hairs in the axils, lowest branches usually solitary, never whorled; spikelets narrowly obovate to oblong, pale greenish-grey to dark green, rachilla persistent in the lower part, usually becoming fragile in the upper part, lemmas and/or paleas breaking up from the base upwards; glumes translucent, usually smooth, longer than 1/3 the length of the lemmas directly above; palea margins nearly touching to touching along the entire length of the palea; anthers 3, 0.6–0.8 mm long; caryopsis ellipsoid.

Flowering December to May. Hillslopes, rocky ridges, in disturbed areas on sandy soil, loam and dolomite. Common. Biome: Savanna and Grassland. Endemic. Reasonably palatable pasture. Intergrades with forms of *E. curvula*.

Description: Stapf 1898–1900 (602), Hitchcock & Chase 1950 (168), De Winter in Chippindall 1955 (145). Illustration: De Winter in Chippindall 1955 (fig. 112). Voucher: Smook 5825, De Winter 626. PRECIS code 9902860–01700.

Eragrostis cilianensis (All.) F.T. Hubb.

Stinkgras.

Annual; loosely tufted (often geniculate); to 900 mm tall. Leaf blades to 250 mm long; to 10 mm wide. Spikelets 3–20 mm long; 1.5–4.0 mm wide. Basal sheaths glabrous, if hairy not densely woolly-hairy; inflorescence with side branches usually 40 mm or shorter, spreading to appressed near the apex of the inflorescence, branches and pedicels stout; spikelets narrowly ovate to narrowly oblong, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lemma narrowly to broadly obtuse in profile, 1.7–2.8 mm long; palea keels entire, scabrid; anthers 3, 0.2–0.3 mm long; caryopsis subglobose.

Flowering October to June. Sandy soils, often in moist places, also disturbed areas such as cultivated lands, pathsides and overgrazed places. Locally common. Biome: Grassland, Savanna, and Nama-Karoo. Throughout Africa and in tropical and warm temperate regions of the Old World. Introduced to the New World. Ruderal weed. Resembles *E. annulata*, which has glandular hairs with swollen tips and broadly oblong to broadly ovate caryopsis, and *E. barrellieri* and *E. minor*, which have the caryopsis oblong and the spikelets somewhat narrower.

Description: Chippindall & Crook 1976 (8), Hitchcock & Chase 1950 (154), Clayton et al. 1970–1982 (232).

Illustration: De Winter in Chippindall 1955 (fig. 126), Clayton et al. 1970–1982. Voucher: Ross 1916. PRECIS code 9902860–01800.

Eragrostis ciliaris (L.) R. Br.

Woolly love grass.

Annual; tufted (erect); to 600 mm tall. Leaf blades to 120 mm long; to 5 mm wide. Spikelets 2.0–4.5 mm long; 1.5–2.2 mm wide. Inflorescence contracted, often interrupted, spikelets densely clustered; spikelets usually flushed with purple, rachilla fragile, breaking up from the apex downwards; lemma keels (at least the upper ones in the spikelets) with stiff hairs 0.2–0.4 mm long, especially towards the base; palea keels with hairs 0.5–0.7 mm long, which are exerted from the lemma; anthers 2, 0.20–0.25 mm long.

Flowering throughout the year. Moist sandy soils in disturbed places such as human habitation, cultivated lands, overgrazed and trodden places. Locally common. Biome: Savanna. Extending through tropical Africa, Arabia and Mascarene Islands to India, also tropical America. Pasture (eaten by stock in Mozambique), or weed (ruderal). Belongs to a group of related species, including *E. tenella*, which has an open inflorescence with spreading branches, *E. viscosa*, which has sticky, glandular patches on the inflorescence, and *E. arenicola*, which has the lemma keel smooth or scabrid.

Description: Chippindall & Crook 1976 (149), Stapf 1898–1900 (629), Hitchcock & Chase 1950 (145), Clayton et al. 1970–1982 (204). Illustration: De Winter in Chippindall 1955 (fig. 153). Voucher: Smook 5737. PRECIS code 9902860–01900.

Eragrostis cimicina Launert

Perennial; occasionally rhizomatous and tufted (densely); to 1500 mm tall. Leaf blades 50–320 mm long; to 5 mm wide. Spikelets 3–6(–9) mm long; 3–5 mm wide. Basal sheaths glabrous or hairy at the base but not woolly-hairy; inflorescence open; spikelets with the opposite rows of florets closely packed and overlapping at the base, rachilla not visible, spikelet rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lemma smooth and shiny, obtuse to subobtusely, lateral nerves distinct, median keel with long cilia on the lower 1/3; palea elliptic, thickly cartilaginous, especially between the keel and the margins, margins nearly touching along the entire length, keels smooth to scaberrulous; anthers 3, 1.5–2.0 mm long; caryopsis broadly oblong with a deep pit dorsally.

Flowering January to March. Sandy loam on floodplains. Infrequent. Biome: Savanna. Southern Angola, Zambia and Zimbabwe. Similar to *E. capensis*, which has the inflorescence contracted rather than open and the spikelets dull and granular.

Description: Launert 1970 (221). Voucher: De Winter 9204. PRECIS code 9902860–02000.

Eragrostis congesta Oliv.

Weak perennial; tufted (erect or geniculate); to 800 mm tall. Leaf blades 100–200 mm long; 3–4 mm wide. Spikelets 3–10 mm long; 1.2–2.0 mm wide. Inflorescences consisting of 2–8 dense, distant clusters; spikelets elliptic to narrowly oblong, breaking up from the base upwards, rachilla



breaking off above the glumes soon after the lemmas begin to fall; palea keels scaberrulous; anthers 3, 0.3–0.4 mm long.

Flowering May to July. Moist areas or disturbed places, such as roadsides. Infrequent. To east Africa. Said to be locally common in Zimbabwe. Up to this time, only a few specimens have been collected from one small area in the FSA region.

Description: Chippindall & Crook 1976 (156), Clayton et al. 1970–1982 (224). Illustration: De Winter in Chippindall 1955 (fig. 106). Voucher: Strey 10947. PRECIS code 9902860–02100.

Eragrostis crassinervis Hack.

Perennial; occasionally hydrophyte and stoloniferous, tufted (densely); to 600 mm tall. Leaf blades to 100 mm long; to 2.5 mm wide. Spikelets 4.5–8.0 (–15.0) mm long; 2–3 mm wide. Inflorescence narrow, unbranched or only sparsely branched, spikelets appressed to the main axis or branches, pedicels short and stout; spikelets light green to straw coloured, or purple or at least flushed with purple, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lemma usually truncate to concave between the keel and the lateral nerves, which are raised and excurrent into minute mucros and have small glandular pits; palea moderately wide between the margins and the keels, margins not touching, keels entire, flattened, equally broad for the entire length; anthers 3, 0.4–0.6 mm long; caryopsis subglobose.

Flowering January to April. Moist places such as river beds and vleis, sometimes on brackish soils. Infrequent. Biome: Savanna and Nama-Karoo. Zimbabwe. Resembles *E. walteri*, which has the palea keels very broad in the lower 2/3, narrowing sharply to the apex where they are excurrent into a small, soft mucro.

Description: De Winter in Chippindall 1955 (178). Voucher: Giess 8108, Giess 9566. PRECIS code 9902860–02200.

Eragrostis curvula (Schrud.) Nees

(= *E. robusta* Stent) 8.

Oulandsgras, weeping love grass.

Wiry perennial; erect and densely tufted; to 1200 mm tall. Leaf blades to 500 mm long; to 3 mm wide. Spikelets 4–10 mm long; 1.0–1.5 mm wide. Plants variable; culms unbranched, not easily compressed, nodes glabrous; basal sheaths densely hairy for quite a way up from the base, with long hairs in the deep furrows between the prominent, squarish ridges formed by the closely packed nerves; leaf blades rolled or flat, appearing setaceous, with long tapering, filiform tips; inflorescence much branched, variable, being open and spreading, or contracted with the branches appressed to the main axis, the lowest branches whorled or not whorled, the pedicels smooth or with prickles distant from one another, the spikelets appressed to the branches; spikelets linear to oblong, rachilla persistent or upper part often fragile, lemmas and/or paleas breaking up from the base upwards; glumes translucent, of variable length but longer than 1/3 the length of the lemmas above in the intact spikelet, smooth or scaberrulous at the apex and along the keels; lemma pale green to dark green to greyish; palea margins meeting or overlapping for the entire length, keels a thin narrow line or palea apparently only folded; anthers 3, 0.6–1.0 mm long; caryopsis ellipsoid.

Flowering August to June. In high rainfall areas on sandy or acid to loamy soils, often in disturbed or badly

managed areas. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. Northwards to east Africa, introduced throughout the tropics mainly as a fodder. Widely cultivated pasture, or erosion control (rehabilitation of roadverges and ground cover), or weed (where it has escaped from cultivation and in some areas of the world where it has been introduced). A very variable grass, with several ploidy levels, which appears to grade into other species such as *E. chloromelas*, *E. barbinodis*, *E. caesia*, *E. lehmanniana*, *E. planiculmis* and *E. rigidior*. This species is currently under investigation.

Description: Chippindall & Crook 1976 (17), Stapf 1898–1900 (599), Hitchcock & Chase 1950 (168), De Winter in Chippindall 1955 (142), Clayton et al. 1970–1982 (243). Illustration: De Winter in Chippindall 1955 (fig. 110 & 111). Voucher: Smook 3839, Smook 3254, Retief 129, S. van Wyk 114. PRECIS code 9902860–02300.

Eragrostis cylindriflora Hochst.

(= *E. horizontalis* Peter) 9.

Annual; loosely tufted (usually erect); to 800 mm tall. Leaf blades 30–150 mm long; 2–4 mm wide. Spikelets 3–8 mm long; 0.5–1.5 mm wide. Leaf sheaths nearly always dotted with oblong glands; inflorescences with the lowest branches whorled; spikelet with rachilla persistent in the lower part and fragile above, lemmas and/or paleas breaking up from the base upwards; lower glume 4/5 as long as to longer than the lemma above in the intact spikelet; lowest lemma 1.5–1.7 mm long, chartaceous to membranous, broadly elliptic, obtuse to subacute, lateral nerves obscure; palea keels minutely scaberrulous; anthers 3, 0.8–1.0 mm long; caryopsis ellipsoid.

Flowering January to August. Sand, clayey loam or black turf in river beds, depressions and in disturbed areas such as overgrazed places. Locally common. Biome: Savanna. Tropical Africa. Resembles *E. glandulosipedata*, which has lemmas with distinct lateral nerves, and *E. omahekensis*, which has the lowest lemma 1.8–2.2 mm long, and *E. trichophora*, a perennial species. Tends to intergrade with *E. porosa*, which has obovate-elliptic lemmas, with truncate to broadly rounded apices.

Description: De Winter in Chippindall 1955 (150), Clayton et al. 1970–1982 (239). Illustration: Clayton et al. 1970–1982 (fig. 66). Voucher: De Winter 2731, De Winter 2284. PRECIS code 9902860–02400.

Eragrostis dinteri Stapf

Annual; tufted (erect; occasionally geniculate and rooting at the nodes); to 500 mm tall. Leaf blades to 150 mm long; to 8 mm wide. Spikelets 7–17 mm long; 3–5 mm wide. Basal sheaths glabrous or with bulbous-based hairs on the margins; spikelet rachilla fragile in upper part and subsistent below, breaking up from the apex downwards; upper glume 2/3–4/5 as long as the lemma above in the intact spikelet; lemmas of the same texture throughout, acuminate, usually with a median awn; palea keels entire, scabrid; anthers 3, 1.2–1.5 mm long; caryopsis subglobose.

Flowering February to June. Deep, red sandy soils and disturbed areas. Locally common. Biome: Savanna. Angola. Similar to *E. rogersii*, which has acute lemmas with or without a short mucro. A strong smell has been recorded for the plant.

Description: De Winter in Chippindall 1955 (172). Voucher: Smook 5220; Biegel, Muller & Gibbs Russell 4999. PRECIS code 9902860–02700.



Fig. 85. Pl. 78.



Eragrostis echinochloidea Stapf

Tick grass, bosluisgras.

Perennial; tufted (erect or geniculate); to 900 mm tall. Leaf blades to 500 mm long; to 6 mm wide. Spikelets 2–6 mm long; 2.2–3.5 mm wide. Basal sheaths glabrous or long-hairy at the extreme base only; inflorescence sparsely branched, spikelets densely congested and second on the branches, pedicels short and stout; spikelet rachilla very fragile, easily disarticulating between the florets from the apex downwards; lower glume acuminate; palea acute, keels scaberulous, with the lower portion very broad and projecting from the upper portion, top of broad portion ends in deep notch or tooth; anthers 3, 0.5–0.7 mm long; caryopsis elliptic.

Flowering November to May. Prefers shallow moist calcrete soils especially around pans, also disturbed sandy places such as cultivated lands. Infrequent to locally common. Biome: Savanna and Nama-Karoo. Endemic; has been naturalized in Arizona (USA). Drought resistant palatable pasture (especially when green), or indicator (denuded veld). Resembles *E. brizantha*, which has glumes obtuse to subacute in profile and palea keels entire.

Description: Stapf 1898–1900 (627), De Winter in Chippindall 1955 (174). Illustration: Muller 1984 (fig. 74), De Winter in Chippindall 1955 (fig. 145). Voucher: De Winter & Wiss 4427, Retief 1530. PRECIS code 9902860–02800.

**Eragrostis elatior** Stapf

Perennial; rhizomatous and tufted (densely); to 500 mm tall. Leaf blades to 200 mm long; to 3.5 mm wide. Spikelets 5–8 mm long; 2.0–2.5 mm wide. Leaves mainly cauline; inflorescence slender, 50–200 mm long, unbranched or sparsely branched, branches and spikelets appressed to the main axis, spikelets solitary or in distant clusters of 2–6 spikelets along the main axis, not overlapping each other; spikelets dark olive green, lemmas hardly diminishing in length towards the apex, rachilla subsistent, fragile in the upper part; glumes cartilaginous, upper glume lanceolate to oblong; lemma acute to subacute, lateral nerves distinct, lowest lemma 2.5–3.0 mm long; palea margins nearly touching or touching for the entire length, keels a raised ridge, scabrid; anthers 3, 0.6–1.0 mm long; caryopsis oblong-elliptic.

Flowering December and March. Rocky banks of rivers and periodically inundated areas. Locally common (coastal areas of the southwestern Cape). Biome: Fynbos. Endemic. Resembles *E. chapelieri*, which has many spikelets and the spikelets and branches overlapping except the lower branches which are sometimes distant.

Description: Stapf 1898–1900 (617), De Winter in De Winter in Chippindall 1955 (161). Voucher: Kruger 1177. PRECIS code 9902860–02900.

**Eragrostis gangetica** (Roxb.) Steud.

Annual; tufted (erect); to 800 mm tall. Leaf blades to 600 mm long; 1–3 mm wide. Spikelets 3–10 mm long; 1.0–1.7 mm wide. Inflorescence usually open, pedicels long and slender; spikelets with rachilla persistent, lemmas and/or paleas breaking up from the base upwards; palea keels scaberulous; anthers 2, 0.1–0.3 mm long; caryopsis subglobose.

Flowering January, April, and May. Open areas near marshes or temporary vleis. Infrequent. Biome: Savanna.



Throughout tropical Africa and India. Resembles the more slender forms of *E. membranacea*, which has anthers 3, 0.8–1.3 mm long.

Description: Launert 1970 (160:96), Stapf 1898–1900 (617), Clayton et al. 1970–1982 (217). Voucher: Schweickerdt 2194. PRECIS code 9902860–03000.

Eragrostis glandulosipedata De Winter

Annual; tufted (geniculate); to 1000 mm tall. Leaf blades to 300 mm long; to 5.5 mm wide. Spikelets 3–5 mm long; 1.0–1.8 mm wide. Inflorescence with the lowest branches whorled; spikelets with the rachilla persistent, sometimes fragile in the upper part, lemmas and/or paleas breaking up from the base upwards; lowest lemma broadly elliptic to broadly oblong-ovate, obtuse to subacute, 1.5–1.7 mm long, lateral nerves conspicuous; palea keels scaberulous; anthers 3, 0.8–1.0 mm long; caryopsis oblong to broadly oblong.

Flowering February to June. Sand, gravel, turf and calcareous soils and in areas of high moisture and disturbance. Locally common. De Winter (1961, Bothalia 7) cites a single specimen, Bogan 3119, from Kenya. Pasture (probably good as fodder). Resembles *E. cylindriflora*, which has lemmas with obscure lateral nerves, and *E. omahekeensis*, which has the lowest lemma 1.8–2.2 mm long.

Description: De Winter 1961 (469). Voucher: De Winter 2290, Giess, Volk & Bleissner 6413. PRECIS code 9902860–03100.

**Eragrostis gummiflua** Nees

Gum grass, gomgras.

Perennial; densely tufted; to 900 mm tall. Leaf blades to 500 mm long; to 4.5 mm wide. Spikelets 2.5–4.0 mm long; 1.0–1.8 mm wide. Culms with sticky glandular patches below the nodes and on the leaf sheaths below the collar, noticeable because soil particles adhere to the patches; spikelet rachilla fragile, lemmas and/or paleas breaking up from the apex downwards; palea keels scaberulous; anthers 3, 0.5–0.8 mm long; caryopsis oblong-elliptic.

Flowering September, and November to April. Locally common. Biome: Fynbos, Savanna, and Grassland. Mozambique. Domestic use (brooms in Lesotho).

Description: Chippindall & Crook 1976 (152), Stapf 1898–1900 (629), De Winter in Chippindall 1955 (178). Illustration: De Winter in Chippindall 1955 (fig. 152). Voucher: Smook 3009. PRECIS code 9902860–03200.

**Eragrostis habrantha** Rendle

Perennial; tufted (erect); to 1000 mm tall. Leaf blades to 100 mm long; to 5 mm wide. Spikelets 1–2 mm long; to 1.2 mm wide. Inflorescence linear, delicate, much branched, branches fine and flexible; mature spikelets very broadly ovate, 2–3-flowered, rachilla subsistent, fragile in the upper part, lowest floret persistent; palea keels smooth to scaberulous; anthers 3, 0.6–0.8 mm long.

Flowering January to May. Sandy and clayey soils in open damp areas along rivers and around vleis. Locally common (limited to a few sites in the FSA area, becoming more widespread northwards). Biome: Savanna and Grassland. Central tropical Africa. Resembles *E. micrantha*, which has a linear to oblong spikelet, and the inflorescence resembles *E. biflora*, which is an annual plant.

Description: Chippindall & Crook 1976 (158), De Win-



ter in Chippindall 1955 (154). Voucher: Gertenbach 7027, Volk A39. PRECIS code 9902860-03300.

Eragrostis heteromera Stapf

Moderately slender perennial; tufted (erect); to 1000 mm tall. Leaf blades to 150 mm long; 2–4 mm wide. Spikelets 4–9 mm long; to 1.5 mm wide. Culms not densely compacted at the base and easily separable, nodes glabrous; basal sheaths glabrous or obscurely hairy; leaf blades long-tapering at the tip; inflorescence open, moderately branched, lowest branches 1–8, whorled or not whorled, spikelets appressed to the branches, pedicels (except terminal ones) shorter than or as long as the spikelets; spikelets linear to oblong, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes translucent, smooth or scabrous on the keels and apex, 1/3–3/4 the length of the lemmas directly above in the intact spikelet; lemma purple to violet to green, often with yellow especially near the apex, nerves usually prominent, strongly keeled with keel prominent along the entire length; palea margins meeting or overlapping along the entire length, keels distinct but a narrow line; anthers 3, 0.8–1.0 mm long; caryopsis narrowly oblong.

Flowering December to May. On moist sand or black clay in depressions, seasonal pan margins and in disturbed areas. Locally common. Biome: Savanna and Grassland. Northwards to Ethiopia. Pasture (of average fodder value). Similar to *E. rotifer*, which has densely hairy basal sheaths.

Description: Chippindall & Crook 1976 (171), Stapf 1898–1900 (610), De Winter in Chippindall 1955 (156), Clayton et al. 1970–1982 (215). Illustration: De Winter in Chippindall 1955 (fig. 123). Voucher: De Winter & Codd 498. PRECIS code 9902860-03400.

Eragrostis hierniana Rendle

(=*E. uniglumis* Hack.) 9.

Perennial; tufted (sometimes geniculate); to 1000 mm tall. Leaf blades 100–250 mm long; 2–4 mm wide. Spikelets 5–12 mm long; 1.0–2.5 mm wide. Spikelets with the rachilla persistent, the lemmas and/or paleas breaking up from the base upwards; lemma glabrous or with hairs less than 0.3 mm long; palea keels with hairs 0.3–2.0 mm long, extending beyond the lemma; anthers 3, 0.8–1.2 mm long.

Flowering August to April. Moist sandy soils in hollows on hills, along rivers and in disturbed areas such as old cultivated lands. Locally common (in Natal, only in Muzi swamps). Biome: Savanna. Northwards to Tanzania. Resembles *E. lappula*, which has hairs longer than 0.3 mm on the lateral nerves of the lemma, and *E. inamoena*, which has scabrid palea keels.

Description: De Winter in Chippindall 1955 (164), Clayton et al. 1970–1982 (213). Voucher: Godfrey & Acocks SH 1601. PRECIS code 9902860-03450.

Eragrostis homomalla Nees

(=*E. hygrophila* C.E. Hubb. & Schweick.) 1.

Reengrassie.

Annual; tufted (erect to decumbent); to 500 mm tall. Leaf blades 20–100 mm long; 1–4 mm wide. Spikelets 2–7 mm long; 0.7–1.0 mm wide. Inflorescence heavy, branches spreading or appressed to the main axis, rigid, spikelets irregularly and densely condensed along the primary branches, pedicels stout; spikelets linear to oblong, lemmas on the same side of the rachilla distinctly overlapping the lemma above, rachilla subpersistent, lemmas and/or paleas breaking up from the base upwards; lower glume to 1/3 the length of the lemma above in the intact spikelet; lemma ovate-elliptic, 1.0–1.5 mm long; palea keels smooth to scabrid; anthers 3, 0.3 mm long; caryopsis ellipsoid.

Flowering January to May. Moist, sandy loam or clay in brackish depressions or seasonally wet pans. Locally common. Biome: Savanna and Nama-Karoo. Endemic, except for a single specimen, Estes 29, recorded from Kenya.

Description: Stapf 1898–1900 (631), De Winter in Chippindall 1955 (153), Clayton et al. 1970–1982 (214). Illustration: De Winter in Chippindall 1955 (fig. 121). Voucher: Smook & Gibbs Russell 2454a, Leistner 1762. PRECIS code 9902860-03500.

Eragrostis inamoena K. Schum.

(=*E. atrovirens* auctt., non Trin. ex Steud.).

Perennial; loosely tufted and rhizomatous (rhizome short and oblique to long and branched); to 1000 mm tall. Leaf blades 40–250 mm long; 2–4 mm wide. Spikelets 5–20 mm long; 2.0–3.5 mm wide. Basal sheaths glabrous at the base; leaves mainly cauline; inflorescence 50–200 mm long, variable, grading from open with spreading branches to contracted with branches overlapping one another and appressed to the main axis, pedicels (except the terminal ones) shorter than, or as long as the spikelets; spikelets dull, greyish-green to dark green, frequently flushed with purple, 7–40-flowered, lemmas hardly becoming shorter towards the apex, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; upper glume acute; lowest lemma 1.6–2.5 mm long, acute, lateral nerves distinct; palea narrowly obovate, membranous except for the keel, apex truncate to obtuse, margins nearly touching to touching along the entire length, keels narrow, flat, but distinct, entire, scabrous; anthers 3, 0.6–1.3 mm long; caryopsis narrowly elliptic.

Flowering November to May. Sandy to organically rich soils on seasonally flooded areas and marshy places. Locally common. Biome: Savanna. Northwards into east Africa. Resembles *E. lappula* and *E. hierniana*, which have the palea keels with hairs longer than 0.3 mm, and *E. chapelieri*, which has the palea margins not touching and reddish brown spikelets.

Description: Chippindall & Crook 1976 (154), De Winter in Chippindall 1955 (163), Clayton et al. 1970–1982 (218). Illustration: De Winter in Chippindall 1955 (fig. 132). Voucher: Smook 5708, Smook 5710. PRECIS code 9902860-03550.

Eragrostis jeffreysii Hack.

Geelhoutpluimgras.

Robust perennial; tufted; to 2000 mm tall. Leaf blades to 1000 mm long; to 10 mm wide. Spikelets 5–8 mm long; 1.0–1.5 mm wide. Culms easily compressed; basal sheaths hairy at the base, leaves flat and mainly basal; inflorescence open, branches spreading, lowest branches whorled, branches and pedicels yellow, scabrid, not thickly covered with prickles; spikelets linear to oblong, rachilla persistent in lower portion, often fragile in upper part, lemmas and/or paleas breaking up from the base upwards; glumes 1/2–2/3 the length of the lemmas directly above in the intact spikelet and the lower glume not wide enough to cover the lemma; lemma pallid to pale greyish-green; palea margins almost touching the entire length, touching and overlapping at the apex, keels entire, obscure, smooth to

scaberulous; anthers 3, 0.8 mm long.

Flowering February and June. Sandy moist areas. Infrequent. Biome: Savanna. To Zimbabwe. Close to *E. curvula*, which has culms that are not easily compressed and leaves to 3 mm wide, and a detailed study is needed in this group.

Description: Launert 1970 (160:107), Hackel 1909 Feddes Rep. 6 (322). Voucher: Volk 1019. PRECIS code 9902860-03570.

Eragrostis kingesii De Winter

Annual; tufted (erect to decumbent); to 100 mm tall. Leaf blades to 20 mm long; to 3 mm wide. Spikelets to 5 mm long; 1.0–1.5 mm wide. Basal leaf sheaths glabrous or with a few scattered, bulbous-based hairs near the apex; leaf blade margins with raised glands, midrib with glandular dots; inflorescence moderately to densely contracted, side branches less than 40 mm long, rigid, pedicels stout; spikelets lanceolate, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lower glume 1/2–2/3 the length of the lemma above in the intact spikelet, strongly keeled; lemma acute, 1.5–1.8 mm long; palea keels scabrid; anthers 3, 0.1–0.3 mm long; caryopsis oblong-elliptic.

Flowering February to May. Disturbed soils along roadsides and in farmyards. Locally common (Luderitz area). Biome: Desert. Endemic. Weed. Similar to *E. procumbens*, which has spikelets 2.0–2.5 mm wide, and *E. pygmaea*, which has many bulbous-based hairs on the lower leaf sheaths and a subglobose caryopsis.

Description: De Winter 1961 (470). Voucher: De Winter & Giess 6083. PRECIS code 9902860-03600.

Eragrostis laevisissima Hack.

Perennial, or annual (occasionally); densely tufted (erect or occasionally geniculate), or rhizomatous (rhizome oblique); to 800 mm tall. Leaf blades to 150 mm long; 1–2 mm wide. Spikelets 2–8 mm long; 1.3–2.0 mm wide. Inflorescence open, spikelets condensed on the branches, lowest branches 1–2, not whorled, pedicels short and stout; spikelets oblong to ovate, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes 1/2–2/3 the length of the lemmas directly above; lemma with lateral nerves with small round glands, which sometimes give a lumpy appearance to the nerves and keel; palea margins touching along the entire length, keels a thin line, glandular and scabrid; anthers 3, 0.6–1.2 mm long.

Flowering February to March. Sandy and brackish calcareous soils around edges of pans and vleis. Infrequent. Biome: Savanna. Endemic. Resembles forms of *E. sabinae*, which have lemmas with the lateral nerves eglandular.

Description: Launert 1970 (160:101), De Winter in Chippindall 1955 (152). Voucher: Giess & Mueller 13961, Giess & Loutit 14127, De Winter 2940. PRECIS code 9902860-03700.

Eragrostis lamprospicula De Winter

Perennial; tufted (geniculate); to 800 mm tall. Leaf blades to 100 mm long; to 3 mm wide. Spikelets 5–15 mm long; 2.2–3.5 mm wide. Plants not sprawling; basal sheaths glabrous; leaves not forming a dense basal tuft; inflorescence 80–100 mm long; spikelets greyish yellow, rachilla per-

sistent, lemmas and/or paleas breaking up from the base upwards; lower glume lanceolate; lemma with lateral nerves indistinct; palea keels entire; anthers 3, 0.9–1.2 mm long; caryopsis ovate.

Flowering January. Open places on brackish flats. Infrequent. Biome: Savanna. Zimbabwe. Similar to the annual *E. membranacea*. Clayton et al. (1974) place the species in synonymy with *E. pseudosclerantha*. This is unacceptable because the latter species has a sprawling habit with a dense basal tuft of leaves.

Description: De Winter 1961 (471). Voucher: De Winter 734. PRECIS code 9902860-03800.

Eragrostis lappula Nees

Perennial; shortly rhizomatous and tufted (densely, erect); to 1200 mm tall. Leaf blades to 250 mm long; 2–4 mm wide. Spikelets 5–10 mm long; 1.9–4.0 mm wide. Spikelets with the rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lemma with hairs 0.3–1.2 mm long on the lateral nerves and sometimes on the median keel; palea keels with hairs 0.3–1.2 mm long which extend beyond the lemma; anthers 3, 1.2 mm long.

Flowering December to May. Moist sandy soils of annually flooded areas and river beds. Locally common. Biome: Savanna. East Africa. Palatable pasture (when young). Two varieties have been recognized based on whether the inflorescence branches are appressed to the central axis or lax. However intermediates have been found and therefore the varieties have not been upheld in this treatment. Similar to *E. hierniana*, which has glabrous lateral nerves on the lemma, and *E. inamoena*, which has scabrid palea keels.

Description: Chippindall & Crook 1976 (155), De Winter in Chippindall 1955 (164), Clayton et al. 1970–1982 (212). Voucher: Smook 1935; Smook & Gibbs Russell 1956; Smith 2675. PRECIS code 9902860-04000.

Eragrostis leersiiformis Launert

Annual; tufted (erect to geniculate); to 500 mm tall. Leaf blades to 170 mm long; to 2.7 mm wide. Spikelets 3–5 mm long; about 1 mm wide. Inflorescence open, branches spreading, pedicels slender; spikelets with the rachilla fragile, the lemmas and/or paleas breaking up from the apex downwards; palea keels shortly ciliate; anthers 3, 0.16 mm long; caryopsis ovate-elliptic.

Flowering February. Edges of vleis. Infrequent. Biome: Savanna. Zambia. Note: no specimens were available for this study and all the information was obtained from literature. Resembles *E. micrantha*, which is a perennial with the spikelet rachilla persistent, and *E. aspera*, which has a subglobose caryopsis.

Description: Launert 1970 (160:224). Voucher: Van Vuuren 1035 (WIND). PRECIS code 9902860-04100.

Eragrostis lehmanniana Nees var. *chaunantha* (Pilg.) De Winter

Perennial; tufted (erect); to 600 mm tall. Leaf blades to 250 mm long; 1.5–2.0 mm wide. Spikelets 4–8 mm long; to 1 mm wide. Culm nodes and internodes hairy; inflorescence open, lax, branches 1–2 at the base, not whorled; spikelets linear to oblong, rachilla subsistent usually fragile in the upper part;



glumes 1/2–2/3 the length of the lemmas directly above in the intact spikelet; palea margins wide apart (except sometimes at the base), keels a narrow thin line, scabrous; anthers 3, 1.0 mm long; caryopsis oblong.

Flowering December to April. Kalahari sand. Infrequent. Biome: Savanna. Possibly Zimbabwe. Said to be separated from var. *lehmanniana*, which has glabrous culm internodes, but a detailed study is needed.

Description: De Winter in Chippindall 1955 (145). Voucher: Barker 198. PRECIS code 9902860–04200.



Fig. 88. *Eragrostis lehmanniana*

Eragrostis lehmanniana* Nees var. *lehmanniana

Knietjiesgras, Lehmann's love grass.

Perennial; tufted (erect, geniculate, sometimes rooting at the lower nodes); to 600 mm tall. Leaf blades to 100 mm long; 1.5–2.8 mm wide. Spikelets 4–8 mm long; 1.0–1.5 mm wide. Culm nodes (those without branches) glabrous; basal sheaths papery, nerves round, not close together or forming prominent ridges, glabrous or slightly hairy at the extreme base only; leaf blades gradually narrowing to the apex; spikelets linear to oblong, dark green, grey-green to red with yellow, rachilla subpersistent, fragile in the upper portion; glumes 1/2–2/3 the length of the lemmas directly above in



Fig. 88.

the intact spikelet; palea margins wide apart, keels thin and narrow, glabrous or scabrous; anthers 3, 0.7 mm long; caryopsis oblong.

Flowering November to June. Sand or sandy loam usually over limestone, in disturbed areas. Locally common. Biome: Savanna and Nama-Karoo. Zimbabwe and Angola. Introduced into east Africa and India as fodder. Hardy, palatable pasture (especially when young), or erosion control (colonizes bare, eroded or denuded ground), or indicator (denuded veld). Said to be separated from var. *chaunantha* by the hairy culm internodes. A detailed study is needed in this taxon.

Description: Stapf 1898–1900 (601), De Winter in Chippindall 1955 (145). Illustration: De Winter in Chippindall 1955 (fig. 113). Voucher: Smook 2928, Van Vuuren & Giess 1127. PRECIS code 9902860–04300.

Eragrostis macrochlamys* Pilg. var. *macrochlamys

Annual; tufted (erect and geniculate to procumbent); to 300 mm tall. Leaf blades to 200 mm long; to 3 mm wide. Spikelets 4–5 mm long; 3–4 mm wide. Basal sheaths glabrous or with a few scattered hairs, mainly along the margins; inflorescence branches usually appressed to the main axis, occasionally spreading in the lower part, spikelets many and crowded; spikelets with the rachilla fragile, breaking up from the apex downwards; glumes longer than the lemmas directly above in the intact spikelet, glands present on the keels; lemma acute (in profile), mucro present or absent; palea keels entire, scabrid; anthers 3, 0.2–0.4 mm long; caryopsis oblong-lanceolate to oblong-elliptic.



Flowering October to May. Sandy soils in river courses or calcrete soils, also disturbed places like roadsides. Locally common. Biome: Savanna, Nama-Karoo, and Desert. Endemic. Resembles var. *wilmaniae*, which has the inflorescence eglandular, glumes shorter than or equal to the lemma directly above in the intact spikelet, and *E. procumbens*, in which the rachilla is persistent and becomes fragile in the upper part and breaks up after the lower lemmas have started to fall.

Description: De Winter in Chippindall 1955 (175). Illustration: De Winter in Chippindall 1955. Voucher: Giess 1743, Mueller 218. PRECIS code 9902860–04400.

***Eragrostis macrochlamys* Pilg. var. *wilmaniae* (C.E. Hubb. & Schweick.) De Winter**

Annual; tufted (erect, geniculate to procumbent); to 300 mm tall. Leaf blades to 150 mm long; to 2.5 mm wide. Spikelets 4–5 mm long; 3–4 mm wide. Basal sheaths glabrous or with scattered hairs; inflorescence branches usually appressed to the main axis, spikelets many and usually densely crowded; spikelets broadly oblong to broadly ovate, rachilla fragile, breaking up from the apex downwards; glumes 2/3–4/5 the length of the lemmas directly above in the intact spikelet, eglandular; lemma acute to subacute (in profile); palea keels entire, scabrid; anthers 3, 0.2–0.4 mm long; caryopsis oblong-lanceolate to oblong-elliptic.



Flowering February to April. Moist areas in disturbed places and on calcrete soils especially around pans. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Differs from var. *macrochlamys*, which has glands on the inflorescence, glumes equal to or longer than the lemmas directly above in the intact spikelet. Resembles *E. procumbens*, which has the spikelet oblong to elliptic and the rachilla persistent, though the upper portion often becomes fragile, lemmas and/or paleas breaking up from the base upwards.

Description: De Winter in Chippindall 1955 (175). Illustration: De Winter in Chippindall 1955. Voucher: Henri 32. PRECIS code 9902860–04500.

Eragrostis membranacea Hack. ex Schinz

Annual; hydrophyte (occasionally), tufted (erect); to 1100 mm tall. Leaf blades to 400 mm long; to 5 mm wide. Spikelets 3–15 mm long; 1.9–4.0 mm wide. Basal sheaths glabrous; inflorescence open; spikelets with rachilla persistent, the lemmas and/or paleas breaking up from the base upwards; upper glume $1/4$ – $1/2$ the length of the lemma above in the intact spikelet; lemma very broadly ovate to almost oblate, narrowly obtuse (in profile), coriaceous, glossy with a clear broad membranous margin in the upper part; palea keels entire, glabrous to minutely scaberulous; anthers 3, 0.8–1.2 mm long.

Flowering January to March. Sandy soils in moist areas around pans and water courses, occasionally in shallow water. Infrequent. Biome: Savanna. Zimbabwe & Zambia. Similar to *E. lamprospicula*, which is said to be perennial and to show a small difference in caryopsis structure. The more delicate forms resemble *E. gangetica*, which has anthers 2, 0.1–0.2 mm long.

Description: De Winter in Chippindall 1955 (170). Voucher: De Winter 9153; Soini PRE 56810. PRECIS code 9902860–04600.

**Eragrostis micrantha** Hack.

Weak perennial; tufted (erect); to 1000 mm tall. Leaf blades to 600 mm long; to 3 mm wide. Spikelets 2–4 mm long; to 1.2 mm wide. Culms not densely compacted at base and easily separated into individual culms; basal sheaths glabrous; leaf blades tapering to a filiform tip; inflorescence 100–300 mm long, effuse, much branched, branches and spikelets spreading, the shortest pedicel of the spikelet pair as long as or longer than the spikelet; spikelets with rachilla persistent in the lower portion, usually fragile in the upper portion, the lemmas and/or paleas breaking up from the base upwards; glumes translucent, smooth or scaberulous around the apex and along the keel, $1/2$ – $2/3$ the length of the lemmas directly above in the intact spikelet; lemma light greenish to green-grey, strongly keeled along the entire length; palea margins meeting or overlapping along the entire length or at least at the apex, keels a thin line or apparently palea only folded; anthers 3, 0.6–1.0 mm long; caryopsis lanceolate.

Flowering January to May. Sands, loams and calcareous soils in disturbed areas and moist places around vleis and pans, in semi-shade. Locally common. Biome: Savanna, Grassland, and Nama-Karoo. Endemic. Could be confused with an undescribed species from Swaziland, which has a robust rhizome and a more montane habitat (eg. Compton 26766).

Description: Launert 1970 (160:92), Stapf 1898–1900 (608), De Winter in Chippindall 1955 (151). Voucher: Smook & Gibbs Russell 2425. PRECIS code 9902860–04700.

**Eragrostis minor** Host

(=*E. poaeoides* Beauv. ex Roem. & Schult.) L.

Little love grass.

Annual; loosely tufted (often geniculate); to 600 mm tall. Leaf blades to 120 mm long; to 5 mm wide. Spikelets 3–19 mm long; 1.3–2.0 mm wide. Leaf margins with raised glands; inflo-



rescence open, side branches usually less than 40 mm long, pedicels stout; spikelet with the rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes subequal; lemma obtuse; palea keels scabrid; anthers 3, 0.3 mm long; caryopsis broadly oblong.

Flowering November. Disturbed and weedy places. Infrequent. Naturalized from southern Europe. Biome: Savanna. Warm temperate and subtropical regions of the Old World, occasionally found as an introduction in the New World tropics. Weed. Intergrades with *E. cilianensis* and *E. procumbens*, and resembles *E. barleri*, which has unequal glumes in the intact spikelet.

Description: De Winter in Chippindall 1955 (153), Clayton et al. 1970–1982 (234). Voucher: Smith 6166. PRECIS code 9902860–04750.

Eragrostis moggii De Winter var. *moggii*

Perennial; tufted (erect, geniculate to decumbent and rooting at the nodes); 400–900 mm tall. Leaf blades to 200 mm long; to 3 mm wide. Spikelets 4–7 mm long; 1.0–1.5 mm wide. Culm nodes glabrous; inflorescence open, branches spreading, pedicels long to very long, with an annular gland; spikelets linear to oblong, green to greyish-green, rachilla persistent, lemmas and/or paleas tardily breaking up from the base upwards; glumes to $2/3$ the length of the lemmas directly above in the intact spikelet, often flushed purple; palea margins apart and not touching for the entire length, sometimes touching at the base, keels a thin line, entire, scaberulous; anthers 3, 0.5–0.7 mm long; caryopsis oblong.



Flowering December and April. Sandy soils, especially in open forests. Infrequent. Biome: Savanna and Forest. Mozambique.

Description: De Winter 1966 (137). Voucher: Smook 5720. PRECIS code 9902860–04900.

Eragrostis nindensis Fical. & Hiern

(=*E. denudata* Hack. ex Schinz) L.

Agtdaepluimgras.

Slender perennial; densely tufted; to 900 mm tall. Leaf blades 50–300 mm long; 2–3 mm wide. Spikelets 4–20 mm long; 1.5–4.0 mm wide. Culms to 2 mm wide; basal sheaths glabrous or hairy, but not densely woolly-hairy; leaves mainly forming a basal tuft; inflorescence sparsely branched, spikelets solitary or in clusters subsessile on the main axis or side branches; spikelets yellowish-green with a serrated outline, rachilla fragile, breaking up from the apex downwards; lower glume ovate; lowest lemma 2–3 mm long, acute to acuminate, lateral nerves indistinct and not reaching the margin; palea keels entire, flat, winged and scabrid; anthers 3, 1.0–1.4 mm long; caryopsis ellipsoid.

Flowering October to June. Prefers bare exposed areas and stony sandy soils. Locally common. Biome: Savanna and Nama-Karoo. Northwards to Tanzania, Zaire and Angola. Palatable and drought resistant pasture. A polymorphic species varying in shape and size of inflorescence and spikelets, often confused with *E. racemosa*, which has olive to dark green spikelets with margin outline usually entire, rachilla persistent and lemmas and/or paleas breaking up from the base upwards.

Description: Chippindall & Crook 1976 (161), De Winter in Chippindall 1955 (167), Clayton et al. 1970–1982 (211). Illustration: De Winter in Chippindall 1955 (fig. 108 & 137). Voucher: Skarpe 539; Smook 2824. PRECIS code 9902860–05000.



Fig. 89.

Fig. 89. *Eragrostis nindensis****Eragrostis obtusa* Munro ex Fical. & Hiern**

Perennial; tufted (geniculate); to 400 mm tall. Leaf blades to 150 mm long; to 4.5 mm wide. Spikelets 3–5 mm long; 3–4 mm wide. Basal sheaths glabrous or hairy but not woolly-hairy at the base; inflorescence open and lax to somewhat contracted; spikelets pallid, green to dark grey, broadly ovate to oblong, rachilla extremely fragile, breaking up from the apex downwards; lemma obtuse to rounded, lateral nerves distinct; palea broadly elliptic to round, keels entire, shortly ciliolate; anthers 3, 0.8–1.3 mm long; caryopsis broadly elliptic.

Flowering July to May. Sandy or limestone soils in disturbed places such as roadsides and overgrazed areas. Locally common. Biome: Savanna, Grassland, and Nama-Karoo. Endemic. Indicator (heavily grazed areas). Similar to *E. x pseud-obtusa*, which has the lower part of the palea keels broader and projecting from the upper part and ending in a round or shallow notch at the top. It is said to be intermediate between *E. obtusa* and *E. echinochloidea*, which have the lower part of the palea keel broader and projecting



from the upper part, with a very deep notch at the top.

Description: Stapf 1898–1900 (625), Hitchcock & Chase 1950 (168), De Winter in Chippindall 1955 (173). Illustration: De Winter in Chippindall 1955 (fig. 144). Voucher: Smook & Gibbs Russell 2412; Smook 3015. PRECIS code 9902860–05100.

***Eragrostis omahekensis* De Winter**

Sandveldpluimgras.

Annual; tufted (erect and geniculate); 600–800 mm tall. Leaf blades to 300 mm long. Spikelets 5–7 mm long; 0.8–1.5 mm wide. Inflorescence with the spikelets densely clustered on the side branches; spikelets with the rachilla persistent, the lemmas and/or paleas breaking up from the base upwards; lowest lemma chartaceous, broadly elliptic to broadly oblong-ovate, 1.8–2.2 mm long; palea keels scaberulous; anthers 3, 1.0–1.3 mm long; caryopsis obovate-oblong.

Flowering February to May. On sand in disturbed places such as roadsides and cultivated lands. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Pasture (possibly good hay when grown in quantity). Resembles *E. cylindriflora* and *E. glandulosipedata*, which have the lowest lemma up to 1.7 mm long.

Description: De Winter 1961 (473). Illustration: De Winter 1961 (fig. 2). Voucher: De Winter 2498, Liebenberg 4663. PRECIS code 9902860–05200.

***Eragrostis pallens* Hack.**

Besemgras.

Robust perennial; densely tufted (plants with stolons collected at Mkuzi Game Reserve, Natal); to 2000 mm tall. Leaf blades to 1000 mm long; to 8 mm wide. Spikelets 5–15(–25) mm long; 1.5–2.0 mm wide. Culms erect, 2–4 mm wide; leaves mainly basal; inflorescence variable, open with branches spreading or grading to contracted with branches appressed to the main axis; spikelets glossy, greenish-grey to yellowish, rachilla fragile, breaking up from the apex downwards, the upper portion sometimes breaking off as a whole; lowest lemma 1.4–2.0 mm long, broadly obtuse, lateral nerves obscure; palea obovate, usually protruding from the lemma, keels broad and flat, scabrid; anthers 3, 1.2 mm long.

Flowering December to May. Sandy soils, especially with a high moisture content such as around seasonal pans. Locally common. Biome: Savanna. Mozambique. Domestic use (for playing musical instruments in Owamboland), or timber (thatching grass by Owambos).

Description: Stapf 1898–1900 (616), De Winter in Chippindall 1955 (169), Illustration: Muller 1984 (fig. 79), De Winter in Chippindall 1955 (fig. 138). Voucher: De Winter 7380. PRECIS code 9902860–05300.

***Eragrostis patens* Oliv.**

Annual; tufted (erect to procumbent); to 400 mm tall. Leaf blades 30–100 mm long; 2–3 mm wide. Spikelets 7–40 mm long; 1.0–1.5 mm wide. Inflorescence spikelike, with the spikelets in wedge-shaped clusters; spikelets with the rachilla becoming fragile soon after the lower lemmas start to fall, lemmas and/or paleas breaking up from the base upwards; lemma with a mucro or awn to 0.5 mm long,



Fig. 90.

lateral nerves not awned or mucronate; palea keels with hairs to 0.2 mm long; anthers 3, 0.1–0.2 mm long.

Flowering February to June. In disturbed places such as paths and overgrazed veld, usually on sandy soils but also recorded on dolerite and clayey loams. Common (rare in Namibia). Biome: Savanna. Northwards into east Africa and Congo (Brazzaville). Indicator (overgrazed veld).

Description: Chippindall & Crook 1976 (159), Clayton et al. 1970–1982 (225). Illustration: De Winter in Chippindall 1955 (fig. 143), Clayton et al. 1970–1982 (fig. 64). Voucher: Dahlstrand 881. PRECIS code 9902860–05400.

Eragrostis patentissima Hack.

Perennial; rhizomatous (rhizomes stout), tufted (geniculate at base); 500–700 mm tall. Leaf blades to 250 mm long; to 4 mm wide. Spikelets 6–8(–15) mm long; 1.5–3.0 mm wide. Basal sheaths glabrous at the base; inflorescence ovate to orbicular, branches fairly rigid, spreading, pedicels 3 times the length of the spikelets, spreading; spikelets grey-green, rachilla persistent, becoming fragile in the upper portion; lemma acuminate, lateral nerves distinct; palea oblanceolate, thick textured, apex acute to subacute, keels entire, forming a prominent ridge, shortly ciliolate; anthers 3, 0.8–1.0 mm long; caryopsis elliptic.

Flowering November to March. Sandy to loamy soils of open areas in damp places and disturbed areas. Infrequent to locally common. Biome: Grassland. Endemic. Pasture (eagerly grazed by cattle).

Description: Stapf 1898–1900 (613), De Winter in Chippindall 1955 (162). Illustration: De Winter in Chippindall 1955 (fig. 131). Voucher: Acocks 9515. PRECIS code 9902860–05500.

Eragrostis pilgeriana Dinter ex Pilg.

Annual; tufted; to 400 mm tall. Leaf blades to 150 mm long; to 4 mm wide. Spikelets to 8 mm long; 6–7 mm wide. Spikelets strongly flattened, with the sides appearing jagged, disarticulating below the glumes at maturity and falling entire as an unit; lemma lanceolate in profile, keel winged and scabrid; palea keels broadly winged, usually lacerate, protruding laterally from the lemmas; anthers 3, 0.5 mm long.

Flowering February to May. Soil specific, growing on disturbed ground with calcrete and usually a high moisture content. Locally common (on suitable soils). Biome: Savanna. Endemic. This species and *E. superba*, which is perennial, are the only species in *Eragrostis* in the FSA region in which the spikelets disarticulate below the glumes at maturity and fall as entire units.

Description: Launert 1970 (160:83), De Winter in Chippindall 1955 (171). Voucher: Giess 12542. PRECIS code 9902860–05600.

Eragrostis pilosa (L.) Beauv.

Annual; loosely tufted (erect, occasionally geniculate); to 700 mm tall. Leaf blades 20–200 mm long; 1–4 mm wide. Spikelets 3–7 mm long; 0.7–1.2 mm wide. Inflorescence delicate, open, branches and pedicels slender and usually flexible, spikelets distant, axils of branches bearded; spikelets linear to oblong, lemmas on the same side of the rachilla

la distinctly overlapping the lemma above, lemmas becoming conspicuously shorter towards the apex of the spikelet, with the rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lower glume to 1/3 the length of the lemma above in the intact spikelet, weakly keeled; lemma broadly ovate, lateral veins visible, lowest lemma 1.0–1.6 mm long; palea keels glabrous to scabrid; anthers 3, 0.2–0.3 mm long; caryopsis ellipsoid.

Flowering October to May. Sandy soils in wet areas such as pan edges, vleis and river banks, disturbed places, often in the shade. Infrequent to locally common. Biome: Savanna. Tropical and warm temperate regions of Old World, introduced to New World. Weed. Similar to *E. aethiopica*, which has the lowest lemma 0.7–1.0 mm long and the lateral veins not visible, and *E. remotiflora*, which has the lemmas on the same side of the rachilla not overlapping the lemma directly above.

Description: Chippindall & Crook 1976 (164), Hitchcock & Chase 1950 (150), De Winter in Chippindall 1955 (154), Clayton et al. 1970–1982 (214). Voucher: Smook 1765, Hilliard 5383. PRECIS code 9902860–05700.



Fig. 90. *Eragrostis pallens*

Eragrostis plana Nees**Taaipoleragrostis.**

Perennial; densely tufted; to 1000 mm tall. Leaf blades to 800 mm long; to 4 mm wide. Spikelets 6–10 mm long; 0.5–2.0 mm wide. Basal sheaths strongly compressed, smooth and shiny; inflorescence branches usually spreading, spikelets appressed to the branches; spikelets linear-oblong, with the rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lower glume scale-like, reaching up to 1/3 the length of the lemma above and the upper glume barely reaching or just touching the base of the lemma above in the intact spikelet; lemmas with lateral nerves prominent and with glandular dots; palea keels entire, glabrous to scabrid, glandular dots present or absent; anthers 3, 1.6–2.0 mm long; caryopsis oblong.

Flowering November to May. In high rainfall regions in waterlogged, overgrazed, burnt or disturbed areas. In dry areas it favours wet soils around vleis and rivers. Locally common to locally dominant. Biome: Savanna and Grassland. Zimbabwe, Zambia, Malawi, introduced to India. Domestic use (weaving of hats, baskets, necklaces and bangles), or pasture (occasionally grazed in autumn), or indicator (overgrazed and burnt areas), or traditional medicine (in Lesotho). Similar to *E. tenuifolia*, which has an identical caryopsis but no glands on the lateral nerves of the lemmas and is a weak perennial or an annual. Vegetatively very similar to *Sporobolus pyramidalis*, which has one floret per spikelet.

Description: Chippindall & Crook 1976 (162), Stapf 1898–1900 (609), De Winter in Chippindall 1955 (157). Voucher: Smook 4714, Hanekom 1701. PRECIS code 9902860–05800.

Eragrostis planiculmis Nees

(=*E. nebulosa* Stapf) 1.

Besemeragrostis.

Perennial; tufted (erect); to 1200 mm tall. Leaf blades setaceous, 100–900 mm long; to 1.5 mm wide. Spikelets to 8 mm long; 0.5–2.0 mm wide. Base with culms densely and strongly compacted, not easily separated, nodes glabrous; basal sheaths glabrous, inner sheaths often yellow; leaves mainly in a dense basal tuft, leaf blades long-tapering at apex, straight or drooping; inflorescence 100–700 mm long, open, much branched, lowest branches whorled or not whorled, pedicels long; spikelets linear, 5–11-flowered, rachilla persistent in the lower portion, fragile in the upper part, lemmas and/or paleas breaking up from the base upwards; glumes translucent, smooth or scabrous around the apex and along the keels, lower glume up to 3/4 the length of the lemma above in the intact spikelet; lemma dark green to greenish-grey, not strongly keeled, keel obscure in lower part; palea margin nearly touching to touching along the entire length, overlapping at the apex, keel a narrow line; anthers 3, 0.6–1.2 mm long.

Flowering November to April. Clay or dolorite soils in depressions, vlei margins and disturbed areas. Infrequent to locally common. Biome: Fynbos, Savanna, and Grassland. Endemic. Resembles forms of *E. curvula*, which has densely hairy basal sheaths.

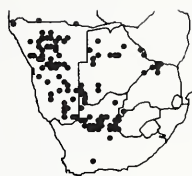
Description: Stapf 1898–1900 (631), De Winter in Chippindall 1955 (142). Voucher: Dieterlen 317, Smook & Gibbs Russell 2169a. PRECIS code 9902860–05900.

**Eragrostis porosa** Nees

Annual; loosely tufted (usually erect); to 800 mm tall. Leaf blades 40–150 mm long; 2–5 mm wide. Spikelets 3–5 mm long; 1.0–1.5 mm wide. Leaf sheaths densely pilose with bulbous-based hairs; inflorescence with the lowest branches whorled; spikelets with the rachilla persistent in the lower part, fragile above, lemmas and/or paleas breaking up from the base upwards; lowest lemma obovate-elliptic, truncate to broadly rounded, 1.0–1.5 mm long; palea keels minutely scabrous; anthers 3, 0.6–0.9 mm long; caryopsis ellipsoid.

Flowering January to July. Stony or sandy soils often on limestone around rivers and pans, also in disturbed areas. Infrequent to common (widespread). Biome: Savanna and Nama-Karoo. Zimbabwe to Kenya, with a few records from Chad and Ethiopia. Reported to intergrade with *E. cylindriflora*, which has the lowest lemma broadly elliptic, obtuse to subacute and 1.5–1.7 mm long.

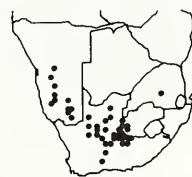
Description: Stapf 1898–1900 (604), De Winter in Chippindall 1955 (150), Clayton et al. 1970–1982 (240). Voucher: De Winter 7472, De Winter & Codd 284, Mostert 1637. PRECIS code 9902860–06200.

**Eragrostis procumbens** Nees

Annual; tufted (geniculate or procumbent); to 500 mm tall. Leaf blades to 200 mm long; to 3.5 mm wide. Spikelets about 7 mm long; (1.7–)2.0–2.5 mm wide. Basal sheaths glabrous or hairy, but not with woolly hairs; inflorescence with the side branches usually appressed to the main axis, though the lower branches sometimes spreading, with many spikelets densely congested and appressed to the branches; spikelets oblong to elliptic, rachilla persistent, sometimes becoming fragile in the upper part, lemmas and/or paleas breaking up from the base upwards; glumes shorter than the lemmas directly above in the intact spikelet; lemmas acute (1.7–)2.0–2.5 mm long, with a minute mucro present or absent; palea keels entire, scabrid; anthers 3, 0.2–0.3 mm long; caryopsis oblong.

Flowering October to June. Moist gravel or sandy soils in depressions, along water courses and disturbed areas. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Weed. Similar to *E. kingesii*, which is a smaller plant with the spikelets 1.0–1.5 mm wide, and *E. macrochlamys* var. *macrochlamys*, in which the rachilla is fragile and the spikelet breaks up from the apex downwards.

Description: Stapf 1898–1900 (620), De Winter in Chippindall 1955 (159). Illustration: De Winter in Chippindall 1955 (fig. 127). Voucher: Zietsman 1666; Smook 3262. PRECIS code 9902860–06300.

**Eragrostis x pseud-obtusa** De Winter

Perennial; tufted (erect); to 600 mm tall. Leaf blades to 150 mm long; 2–3 mm wide. Spikelets 3–5 mm long; 2.5–3.5 mm wide. Basal sheaths glabrous, or if hairy not with long-woolly hairs for a distance up along the sheaths; inflorescence lax to dense, sparsely branched, spikelets congested; spikelets with rachilla fragile, lemmas and/or paleas breaking up from the apex downwards;

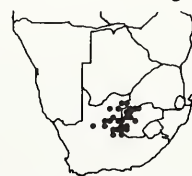


Fig. 91.

glumes boat-shaped, acute to subacute; palea obtuse to rounded, keels with the lower portion very broad and protruding from the rest of the keel, top of the projecting portion rounded or shallowly notched, ciliate; anthers 3, 0.7–0.8 mm long; caryopsis elliptic.

Flowering November to May. Sandy loam, shallow sandy soils, sand over limestone, in moist areas such as ditches, along streambeds and dams, also in disturbed places. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Intermediate between *E. obtusa*, which has the paleas entire, and *E. echinochloidea*, which has the palea acute, and the lower projecting portion of the keels deeply notched at the top.

Description: De Winter 1961 (474). Illustration: De Winter 1961 (476). Voucher: Smook 2785. PRECIS code 9902860–06400.



Fig. 91. *Eragrostis x pseud-obtusa*

Eragrostis pseudosclerantha Chiov.

Footpath love grass.

Short-lived perennial; sometimes stoloniferous (geniculate, rooting at the nodes); 300–400 mm tall. Leaf blades to 90 mm long; to 4.5 mm wide. Spikelets 4–10 mm long; 2–3 mm wide. Plants sprawling; leaves mainly from a dense basal tuft; inflorescence to 75 mm long; spikelets narrowly elliptic, greyish-green, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lower glume lanceolate, to 1/2 the length of the lemma directly above and upper glume 1/2–2/3 the length of the lem-



ma above in the intact spikelet; lemma with lateral nerves indistinct; palea narrow between the keel and the margins, the margins far apart, keels a narrow line, entire, scabrid; anthers 3, 0.8–1.0 mm long; caryopsis ellipsoid.

Flowering September to April. Stony ground in open places in short grassland or under trees, in disturbed places. Locally common. Biome: Savanna and Grassland. Northwards through east Africa to Ethiopia. Weed.

Description: Chippindall & Crook 1976 (169), De Winter in Chippindall 1955 (167), Clayton et al. 1970–1982 (231). Illustration: De Winter in Chippindall 1955 (fig. 138). Voucher: Smook 3158, Chippindall 18. PRECIS code 9902860–06500.

Eragrostis pygmaea De Winter

Annual; tufted (erect or decumbent); to 70 mm tall. Leaf blades to 40 mm long; to 2 mm wide. Spikelets 4–7 mm long; 1.0–1.5 mm wide. Vegetative parts have glandular hairs with swollen tips; basal sheaths densely covered with long, bulbous-based hairs; inflorescence densely contracted, pedicels stout; spikelets narrowly lanceolate, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lower glume 1/2 the length of the lemma above in the intact spikelet; lemma acute, 1.0–1.6 mm long, palea keels scabrid; anthers 3, 0.2 mm long; caryopsis subglobose.

Flowering March to May. Shallow depressions on sandy flats. Locally common (confined to flat areas north of high sand dune between Luderitz and the Kuiseb river). Biome: Desert. Endemic. Similar to *E. kingesii*, which does not have bulbous-based hairs on the leaf sheaths and has an oblong-elliptic caryopsis.

Description: De Winter 1969 (72). Voucher: De Winter & Hardy 8050. PRECIS code 9902860–06600.

Eragrostis racemosa (Thunb.) Steud.

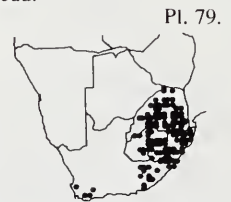
(=*E. chalcantha* Trin.) 1.

Smalhartjie-eragrostis, narrow heart love grass.

Perennial; densely tufted (leaves mainly basal); to 800 mm tall. Leaf blades 60–100 mm long; 2–5 mm wide. Spikelets 3–10 mm long; 1.5–4.5 mm wide. Basal sheaths glabrous or thinly silky-hairy; inflorescence open or contracted, sparsely branched, secondary branches present or absent, primary branches stiff, with 2–4 spikelets on short stout pedicels; spikelets dark greenish-grey, olive or brownish-grey, outline usually smooth, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes cartilaginous, ovate, boat-shaped; lemma with lateral nerves indistinct; palea keels a narrow ridge, entire, scabrous; anthers 3, 1.0–1.6 mm long; caryopsis almost square.

Flowering August to May. On shallow sandy, stony or clayey soils. Common (widespread). Biome: Fynbos, Savanna, and Grassland. North to Sudan, and in Madagascar. Erosion control (useful cover on shallow soils and in heavily grazed areas). Often confused with *E. nindensis*, which has yellowish-green spikelets with a serrate outline and the rachilla fragile and breaking up from the apex downwards. Similar to *E. sclerantha* subsp. *sclerantha*, which has the basal sheaths with dense woolly hairs.

ter in Chippindall 1955 (165), Clayton et al. 1970–1982 (230). Illustration: De Winter in Chippindall 1955 (fig. 135). Voucher: Smook 4792, Kluge 1098. PRECIS code 9902860–06700.



Pl. 79.

Eragrostis remotiflora De Winter

Weak perennial, or annual; tufted (erect or with some culms geniculate); to 600 mm tall. Leaf blades to 250 mm long; to 2.5 mm wide. Spikelets to 5 mm long; to 1 mm wide. Inflorescence open, branches spreading, pedicels slender; spikelets oblong to linear, lemmas on the same side of the rachilla either not or just overlapping the one above, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lower glume less than 1/3 the length of the lemma above in the intact spikelet, weakly keeled; lemma 1.0–1.8 mm long; palea keels scabrid to glabrous; anthers 3, 0.2–0.3 mm long; caryopsis oblong.

Flowering January to April. Wet and damp areas in pans, vleis and river floodplains, also disturbed areas in semi-arid regions. Locally common. Biome: Savanna. Endemic. Pasture (grazed). Similar to *E. pilosa* and *E. aethiopica*, which have the lemmas on the same side of the rachilla overlapping the lemma above.

Description: De Winter 1961 Bothalia 7 (477). Illustration: De Winter 1961 (478). Voucher: Acocks 14016, Smook & Gibbs Russell 2371. PRECIS code 9902860–06800.

**Eragrostis rigidior** Pilg.

Curly leaf, krulblaar.

Perennial; loosely tufted (erect to geniculate); to 1000 mm tall. Leaf blades to 200 mm long; to 5 mm wide. Spikelets 3.5–7.0 mm long; 1.0–1.5 mm wide. Unbranched culm nodes glabrous; basal sheaths papery, nerves rounded and well apart, glabrous to slightly hairy at the very base only; leaf blades narrowing abruptly into a long tapering apex, curly when dry; inflorescence open, branches spreading, lowest branches usually whorled, spikelets usually contracted along the branches; spikelets linear to oblong, rachilla fragile in the upper portion, lemmas and/or paleas breaking up from the base upwards; lower glume 4/5 to longer than the lemma directly above and upper glume 1/2–3/4 the length of the lemma directly above in the intact spikelet; palea margins wide apart except at the base and occasionally touching at the apex, keels a thin line, smooth to scaberrulous; anthers 3, 0.8–1.2 mm long.

Flowering September to May. Sand, loam, humus loam or calcrete soils in open patches, disturbed areas and old cultivation sites. Locally common. Biome: Savanna. East Africa. Pasture (valuable fodder in dry areas). Intermediates with *E. barbinodis*, which has hairy nodes, have been recorded. Resembles *E. lehmanniana*, which has leaf blades that gradually narrow to the apex and do not curl when dry and the inflorescence with the lowest branches never whorled.

Description: Chippindall & Crook 1976 (170), De Winter in Chippindall 1955 (149), Clayton et al. 1970–1982 (242). Illustration: De Winter in Chippindall 1955 (fig. 115). Voucher: Smook 5300. PRECIS code 9902860–06900.

**Eragrostis rogersii** C.E. Hubb.

Annual; tufted (geniculate to rooting at the nodes); to 400 mm tall. Leaf blades to 90 mm long; to 4 mm wide. Spikelets 6–12 mm long; 2.5–4.2 mm wide. Basal sheaths glabrous or with bulbous-based hairs along the margins or scattered near the leaf blades; inflorescence with branches slight-



Fig. 92. *Eragrostis rigidior*

ly spreading, spikelets few and distant; spikelets with the rachilla fragile, breaking up from the apex downwards; upper glume $2/3$ – $3/4$ the length of the lemma above in the intact spikelet; lemma acute (in profile), a median mucro present or absent; palea keels entire, scaberulous; anthers 3, 1.1 mm long.

Flowering March. Disturbed sandy soils. Infrequent. Biome: Savanna. Zimbabwe, Zambia. Resembles *E. dinteri*, which has acuminate and usually awned lemmas. Either rare or poorly collected in FSA area, more common in Zimbabwe.

Description: Hubbard 1934 Kew Bull. (115). Voucher: Ellis 2752. PRECIS code 9902860–07000.

Eragrostis rotifer Rendle

(= *E. margaritacea* Stapf) 1.

Perennial; tufted (erect, occasionally decumbent); to 1500 mm tall. Leaf blades to 300 mm long; to 4 mm wide. Spikelets 4–10 mm long; to 1 mm wide. Basal sheaths densely hairy at the base; inflorescence open, branches spreading, lowest branches whorled, branches and pedicels densely covered with prickles giving a greenish-white appearance, spikelets contracted to the branches; spikelets linear to oblong, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes $1/2$ – $2/3$ the length of the lemmas directly above in the intact spikelet; lemma greyish-green usually flushed purple in the upper portion above which is a yellow portion, and the apex has a white membranous margin; palea margins touching to overlapping at the apex, keels a obscure line, smooth or scaberulous; anthers 3, 0.5–0.8 mm long; caryopsis ellipsoid.

Flowering November to July. Mainly sandy soils in moist areas like vleis, pan edges and river beds, also disturbed areas. Locally common (often pure stands in damp places). Biome: Savanna and Nama-Karoo. Northwards to Tanzania. Pasture (remaining green for long time, valuable fodder in dry areas). Similar to *E. heteromera*, which has the basal sheaths glabrous or obscurely hairy at the very base.

Description: Chippindall & Crook 1976 (171), De Winter in Chippindall 1955 (156), Clayton et al. 1970–1982 (216). Illustration: Muller 1984 (fig. 82). Voucher: De Winter 2397. PRECIS code 9902860–07100.

Eragrostis sabinae Launert

Perennial; stoloniferous and tufted (densely); leaves short, mainly basal; 90–150 mm tall. Leaf blades to 250 mm long; to 1.5 mm wide. Spikelets 4–7 mm long; 0.8–1.0 mm wide. Basal sheaths densely hairy; culm nodes usually with long spreading white hairs; leaf blades only slightly tapering to the apex; inflorescence 25–80 mm long, open, moderately branched, spikelets in loose clusters at the ends of the branches or spreading; spikelets with rachilla persistent in lower portion and fragile in upper part, lemmas and/or paleas breaking up from the base upwards; glumes translucent, smooth or scaberulous along the keel, $1/2$ – $2/3$ the length of the lemmas directly above in the intact spikelet; lemma green to grey-green, usually whitish at the apex; palea margins meeting along the entire length or only touching at the apex, keels a thin line; anthers 3, 0.4–0.8 mm long.

Flowering February to May. Brackish or saline soils around vleis, pans and springs. Locally common. Biome: Savanna. Endemic. Resembles some forms of *E. laevissima*, which has glandular dots on the lateral nerves of the lemmas.

Description: Launert 1970 (225). Voucher: Mueller 1474, Smook 5128. PRECIS code 9902860–07200.

Eragrostis sabulosa (Steud.) Schweick.

Perennial; tufted and rhizomatous (rhizome long and creeping); 60–150 mm tall. Leaf blades 10–40 mm long; to 3 mm wide. Spikelets to 7 mm long; 1.5–2.0 mm wide. Culm internodes short and exceeded by the leaf sheaths; leaves mainly cauline; inflorescence usually less than 40 mm long, very dense with branches appressed to the main axis and spikelets densely crowded and appressed to the branches; spikelets dark olive-grey, rachilla tardily breaking up between the florets; upper glume acute to obtuse and jagged; lowest lemma 1.6–2.5 mm long, lateral veins usually indistinct; palea keels with cilia less than 0.1 mm long; anthers 3, 1.2 mm long; caryopsis ellipsoid.

Flowering March, and October to November. Sandy soils especially beach sand. Locally common. Biome: Fynbos. Endemic. Similar to *E. sarmentosa*, which has the lowest lemma 1.5 mm long and anthers 0.2–0.3 mm long. Resembles *Sporobolus virginicus*, which has only one floret per spikelet, in habit and habitat.

Description: De Winter in Chippindall 1955 (161). Illustration: De Winter in Chippindall 1955 (fig. 129). Voucher: Crook 1040. PRECIS code 9902860–07300.

Eragrostis sarmentosa (Thunb.) Trin.

Mat-forming perennial; short rhizomatous and tufted (culms occasionally geniculate, decumbent and rooting at the nodes); to 400 mm tall. Leaf blades to 100 mm long; to 4.5 mm wide. Spikelets 3–7 mm long; 1.5–1.7 mm wide. Leaves mainly cauline; inflorescence narrow and contracted, branches appressed to the main axis, pedicels thick, spikelet groups often distant on the main axis, spikelets appressed to the branches; spikelets greyish-green to purple, rachilla persistent, the upper part often becoming fragile, lemmas and/or paleas breaking up from the base upwards; upper glume acute; lowest lemma 1.5 mm long, lateral veins distant, usually not reaching the margin, never excurrent into a mucro; palea keels scaberulous; anthers 3, 1.2 mm long; caryopsis ellipsoid to ovoid.

Flowering July to May. Moist, sandy areas such as the edges of riverine vegetation, along floodplains and dams, also in disturbed overgrazed areas. Locally common. Biome: Fynbos, Savanna, and Succulent Karoo. Zambia, Zimbabwe. Similar to *E. sabulosa*, which has the lowest lemma 1.6–2.5 mm long and anthers 0.6–1.3 mm long.

Description: Stapf 1898–1900 (618), De Winter in Chippindall 1955 (162). Illustration: De Winter in Chippindall 1955 (fig. 130). Voucher: De Winter & Vahlmeijer 8584, Smith 773. PRECIS code 9902860–07400.

Eragrostis sclerantha Nees subsp. *sclerantha*

Perennial; densely tufted; to 700 mm tall. Leaf blades to 200 mm long; to 6.5 mm wide. Spikelets 2–5 mm long; 1.5–3.0 mm wide. Basal sheaths densely woolly-hairy, sometimes this only visible on the inner sheaths; inflorescence branches spreading, with many spikelets, either appressed to the branches or spreading; spikelets dark olive-green, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lemma acute, lateral nerves conspicuous; palea keels entire, scabrid; anthers 3, 0.7–1.0 mm long; caryopsis ellipsoid.

Flowering January to May. Sandy soils and sandy loams between rocks (often quartzite). Infrequent (but widespread). Biome: Savanna and Grassland. Zimbabwe,

Angola. Similar to *E. racemosa*, which has the basal sheaths glabrous or hairy, but not densely woolly-hairy, and subsp. *villosipes*, which has a contracted inflorescence with the branches appressed to the main axis. Resembles *E. desolata* Launert found in Zimbabwe, which has the basal sheaths glabrous or hairy, not woolly-hairy, leaf blades 0.5–2.5 mm wide and anthers 1.2–1.3 mm long.

Description: Chippindall & Crook 1976 (172), Stapf 1898–1900 (615), De Winter in Chippindall 1955 (116), Clayton et al. 1970–1982 (229). Illustration: De Winter in Chippindall 1955 (fig. 136). Voucher: Cohen 862, Burt Davy 9240. PRECIS code 9902860–07500.

***Eragrostis sclerantha* Nees subsp. *villosipes* (Jedw.) Launert**

(=*E. sclerantha* Nees var. *villosipes* (Jedw.) De Winter) 7.

Perennial; densely tufted (erect); to 600 mm tall. Leaf blades to 200 mm long; 2–6 mm wide. Spikelets 2–8 mm long; 1.5–2.0 mm wide. Leaves forming a dense basal tuft; basal sheaths with dense, yellowish, woolly hairs; inflorescence narrow, sparsely branched, branches appressed to the main axis, spikelets appressed, solitary or in groups of 2–3, pedicels short; spikelets olive-green, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes cartilaginous, upper glume ovate, boat-shaped; lemma with lateral nerves indistinct and not reaching the margin; palea keels a narrow line, scaberulous; anthers 3, 0.7–1.0 mm long; caryopsis ellipsoid.

Flowering February. Wooded grassland. Infrequent. Biome: Savanna. Tropical Africa. Said to occur in Botswana, and there is a doubtful fragment from Namibia. In the Transvaal only a single specimen has been collected in 1912. Differs from subsp. *sclerantha*, which has the inflorescence spreading.

Description: Launert 1961 Bot. Soc. Brot. 35,2 (19), Chippindall & Crook 1976 (172), De Winter in Chippindall 1955 (66), Clayton et al. 1970–1982 (229). Voucher: Bell PRE 5985. PRECIS code 9902860–07600.

***Eragrostis scopelophila* Pilg.**

Bergpluimgras.

Wiry, much branched shrub or dwarf shrub; tufted (forming dense bushes); to 1000 mm tall. Leaf blades to 250 mm long; to 5 mm wide. Spikelets 3–10 mm long; 2.2–3.3 mm wide. Basal sheaths glabrous; leaves mainly cauline; inflorescence open, pedicels (excluding terminal ones) shorter than or to as long as the spikelets; spikelets green to dark greenish grey, the opposite rows of florets hardly overlapping, rachilla visible and subpersistent with the upper portion fragile; lemma acute to obtuse, lateral nerves distinct; palea margins not touching along the entire length, keels entire, narrow, rounded, scaberulous; anthers 3, 1.3–1.5 mm long; caryopsis broadly oblong.

Flowering December to April (and August and October). Mountainous areas, often associated with dolomite. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Fairly palatable pasture (stays green in winter).

Description: De Winter in Chippindall 1955 (160). Illustration: Muller 1984 (fig. 83). Voucher: De Winter 2342. PRECIS code 9902860–07700.

***Eragrostis stapfii* De Winter**

Perennial; densely tufted (erect); to 500–900 mm tall. Leaf blades to 200 mm long; to 2 mm wide. Spikelets to 4 mm long; 0.5–1.0 mm wide. Basal sheaths glabrous at the base; leaves forming a dense basal tuft, usually tightly rolled and curling; inflorescence open, delicate, lowest branches whorled; spikelets with 2–3(–5) florets, rachilla subpersistent upper part fragile, lemmas and/or paleas breaking up from the base upwards; lower glume to 3/4 the length of the lemma directly above and upper glume 1/3–4/5 as long as the lemma above in the intact spikelet; lemma pale yellowish grey-green, not strongly keeled, more rounded at the back with the keel obscure at the base; palea margins almost touching along the entire length, overlapping at the apex, keels an obscure line, smooth or scaberulous; anthers 3, 0.8 mm long.

Flowering November to April. Shallow sand or coarse sandy soils, sometimes in wet disturbed areas. Locally common. Biome: Savanna. Southern tropical Africa. Resembles *E. micrantha*, which is a weak perennial with lemmas strongly keeled, and *E. habrantha*, which has broadly ovate spikelets.

Description: De Winter in Chippindall 1955 (152). Illustration: De Winter in Chippindall 1955 (fig. 119). Voucher: Giess 14219, Pole Evans 3141. PRECIS code 9902860–07900.

***Eragrostis stenothyrsa* Pilg.**

Perennial; tufted; to 500 mm tall. Leaf blades to 100 mm long; to 2 mm wide. Spikelets 4–8 mm long; 0.8–1.5 mm wide. Leaves in a dense basal tuft; inflorescence contracted, branches closely appressed to the main axis; spikelets lanceolate to narrowly ovate, yellowish, often flushed purple, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lemmas on the same side of the rachilla overlapping the lemma above by 2/3 or more; glumes chartaceous; lemma with lateral nerves not reaching the margin; palea keels a narrow line less than 0.1 mm wide, scaberulous; anthers 3, 1.3 mm long.

Flowering March to April. Moist areas around pans. Rare. Biome: Savanna. Endemic.

Description: De Winter in Chippindall 1955 (141). Voucher: Giess, 14851. Volk 12473. PRECIS code 9902860–08000.

***Eragrostis superba* Peyr.**

Weeluiseragrostis, sawtooth love grass.

Perennial; densely tufted (often geniculate); to 1000 mm tall. Leaf blades to 400 mm long; 3–12 mm wide. Spikelets 6–16 mm long; 3–10 mm wide. Spikelets strongly flattened with the sides appearing jagged, disarticulating below the glumes at maturity and falling as an entire unit; lemma narrowly ovate in profile, keel winged and scaberulous; palea keels broadly winged, entire, minutely ciliate, hardly projecting lateral-



Pl. 80.

ly from the lemma; anthers 3, 1.5–2.5 mm long.

Flowering August to May. Sandy and stony soils in disturbed places or drainage areas. Widely common. Biome: Fynbos, Savanna, and Grassland. Northwards through east Africa to Sudan. Hay and readily grazed, fairly palatable and drought resistant pasture (cultivated in USA), or erosion control (reseeding denuded areas). This species and *E. pilgeriana*, which is annual, are the only *Eragrostis* species in the FSA area with spikelets that disarticulate below the glumes at maturity and fall as entire units.

Description: Chippindall & Crook 1976 (163), Stapf 1898–1900 (622), De Winter in Chippindall 1955 (171). Illustration: Muller 1984, De Winter in Chippindall 1955 (fig. 141). Voucher: Wederman & Oberdieck 2773; Kinges 1426. PRECIS code 9902860–08100.

***Eragrostis tef* (Zucc.) Trotter**

(=*E. abyssinica* (Jacq.) Link) 9.

Teff.

Annual; loosely tufted (erect); to 600 mm tall. Leaf blades to 300 mm long; to 4 mm wide. Spikelets 5.5–9.0 mm long; 1.5–2.0 mm wide. Inflorescence open or contracted, branches usually more than 40 mm long, flexible and slender, pedicels slender; spikelets with rachilla persistent and the lemmas and paleas remaining intact at maturity; upper glume 1/2–2/3 the length of the lemma above in the intact spikelet; lemmas 2.0–2.7 mm long; palea keels scaberulous; anthers 3, 0.3–0.5 mm long; caryopsis oblong.

Flowering November to May (and July and September). An escape from cultivation which grows in weedy places, along roadsides and where it has been naturalized. Infrequent to locally common. Naturalized from northern Africa and Ethiopia. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Northwards to east Africa. Introduced to most tropical countries where it can become adventitious. Food and drink (a staple cereal crop in Ethiopia), or pasture (planted as hay), or erosion control (rehabilitation of road reserves).

Description: Chippindall & Crook 1976 (165), De Winter in Chippindall 1955 (154), Clayton et al. 1970–1982 (213). Voucher: Smook 5423. PRECIS code 9902860–08200.

***Eragrostis tenella* (L.) Roem. & Schult.**

Annual; tufted (erect and geniculate); to 500 mm tall. Leaf blades 60–90 mm long; to 3 mm wide. Spikelets 1.5–2.5 mm long. Inflorescence open, with branches spreading and the spikelets distant, eglandular, or with non-sticky glands; spikelets with rachilla fragile, breaking up from the apex downwards; lemma keel smooth or scabrid; palea keels with hairs 0.3–0.4 mm long and exserted from the lemma; anthers variable, 2–3, (on the same inflorescence), 0.15–0.20 mm long.

Flowering January to April. Bare, moist, sandy soils in disturbed places like pathsides and cultivated lands. Locally common. Biome: Savanna. Throughout Tropics. Weed. Distinguished from *E. viscosa*, which has sticky glandular areas on the inflorescence, but the boundary is not sharp and intermediates are found. Similar to *E. ciliaris*, in which the lemma has long stiff hairs on the keel, and *E. arenicola*, which has the inflorescence contracted with the spikelets

densely appressed to the branches.

Description: Hitchcock & Chase 1950 (168), Clayton et al. 1970–1982 (206). Voucher: Smook 4142. PRECIS code 9902860–08300.

***Eragrostis tenuifolia* (A. Rich.) Steud.**

Weak perennial, or annual; loosely tufted; to 400 mm tall. Leaf blades 40–300 mm long; 1–3 mm wide. Spikelets 4–16 mm long; 1–3 mm wide. Inflorescence open, pedicels slender; spikelet outline coarsely serrate, the lemmas on the same side of the rachilla distinctly overlapping the lemma above, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; upper glume barely reaching to just covering the base of the lemma directly above, lowest lemma 1.2–2.5 mm long; palea keels scaberulous; anthers 3, 0.4–0.5 mm long; caryopsis oblong, strongly laterally flattened.

Flowering January (and a single specimen from the Cape flowering in April). On sandy soils, gravels, clays and loams, usually areas of high moisture, also in disturbed areas. Locally common. Biome: Savanna and Grassland. Throughout tropical Africa, Madagascar, India, New Guinea, Australia and South America. Weed. Allied to *E. plana*, which has an identical caryopsis but is a strong perennial with glands on the lateral nerves of the lemmas. Either poorly collected or only starting to invade in southern Africa.

Description: Chippindall & Crook 1976 (166), Clayton et al. 1970–1982 (238). Voucher: Acocks 23487, Smook 1857. PRECIS code 9902860–08400.

***Eragrostis trichophora* Coss. & Dur.**

(=*E. atherstonei* Stapf) 7;
(=*E. henrardii* Jansen) 7.

Blousaadgras.

Slender, wiry perennial; stoloniferous and tufted (erect to geniculate, rooting at the nodes); to 600 mm tall. Leaf blades to 150 mm long; to 3 mm wide. Spikelets 3.5–5.0 mm long; 1.0–1.2 mm wide. Culms usually branched above; basal sheaths glabrous or hairy, papery and the nerves rounded and well apart at the base, below the collar of the leaf sheaths or around the culm nodes round glandular dots, usually flushed with purple are often present; inflorescence open, branches purplish-yellow with large prickles, spreading, whorled at the base with long hairs in the axils; spikelets oblong to narrowly oblong, with 3–5 florets, rachilla subpersistent, fragile in the upper part, lemmas and/or paleas breaking up from the base upwards; glumes 4/5 as long to longer than the lemmas directly above them in the intact spikelet, lower glume wide and covering most of the lemma above; lemma pale greenish-grey to dark grey, the apex usually membranous and whitish; palea margins apart for most of its length, nearly touching to touching at the apex, keels a narrow line, smooth to scaberulous; anthers 3, 0.8 mm long.

Flowering November to May. On sand and loam, on shallow soils and dolomite in moist places, road verges and other disturbed or overgrazed areas. Common. Biome: Savanna and Nama-Karoo. Southern tropical and north Africa. Pasture (grazed by goats). Similar to *E. cylindriflora*, which is annual, and *E. lehmanniana*, which has the lowest inflorescence branches 1–2 and not whorled.



Description: Chippindall & Crook 1976 (174), De Winter in Chippindall 1955 (149). Illustration: Muller 1984 (fig. 85). Voucher: Smook 6243, De Winter & Giess 6823. PRECIS code 9902860-08500.

Eragrostis truncata Hack.

Mat-forming perennial; rhizomatous (rhizome short and branched), or tufted (forming raised cushions and characteristic rings); to 400 mm tall. Leaf blades (lower) 10–40 mm long (upper blades to 100 mm long); 1.0–1.5 mm wide. Spikelets 5–7 mm long; 2.5–3.0 mm wide. Basal sheaths with dense, long woolly hairs; spikelets completely pallid to flushed with dark purple, spikelet rachilla very fragile, breaking up from the apex downwards, the florets being shed with the rachilla internode; lowest lemma truncate; palea keels scaberrulous; anthers 3, 0.8–1.2 mm long.

Flowering October to May. Mainly in limestone soils, especially in and around pans. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Palatable pasture (grazed by game). Barely distinguishable from *E. bergiana*, and an in-depth study is needed in these two taxa.

Description: Stapf 1898–1900 (624), De Winter in Chippindall 1955 (176). Illustration: De Winter in Chippindall 1955 (fig. 148). Voucher: Ellis 2630, Smook 3487. PRECIS code 9902860-08600.

Eragrostis virescens Presl

Chilean love grass.

Annual; tufted (erect or geniculate); to 700 mm tall. Leaf blades to 250 mm long; 3.5–7.0 mm wide. Spikelets 3.0–4.5 mm long; 1.0–1.2 mm wide. Basal leaf sheaths glabrous; leaf blade margins eglandular, scabrid and the midvein eglandular; inflorescence open, side branches spreading, pedicels long and slender, spikelets tending to be condensed to the branches; spikelets oblong, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; lower glume 1/3–1/2 the length of the lemma above in the intact spikelet; lemma 1.3–1.7 mm long; palea keels scabrid; anthers 3, 0.2–0.3 mm long; caryopsis oblong.

Flowering December to March. Sandy soils in cultivated and disturbed areas. Locally common. Naturalized from South America. Biome: Savanna, Grassland, Nama-Karoo, South and North America. Weed (in gardens and lands).

Description: Hitchcock & Chase 1950 (151), De Winter in Chippindall 1955 (154). Voucher: Smook 3835, Smook 2839. PRECIS code 9902860-08800.

Eragrostis viscosa (Retz.) Trin.

Sticky love grass.

Annual; tufted (erect and geniculate); to 500 mm tall. Leaf blades 40–100 mm long; 2–5 mm wide. Spikelets 2–3 mm long; 1.0–1.5 mm wide. Inflorescence with sticky glands (noticeable due to particles adhering to them), open, with the branches spreading and the spikelets distant; spikelets with the rachilla fragile, breaking up from the apex downwards; lemma keel glabrous, palea keels with hairs 0.4–0.5 mm long and exserted from the lemma; anthers 3, 0.1–0.3 mm long.

Flowering February to August. Disturbed and open places with sandy or shallow soils. Locally common. Biome: Savanna. Northwards through east Africa to Nigeria; to India, Thailand and Philippines, with a few records from tropical America. Weed and indicator (of poor soil condition and overgrazing). Strong smelling when fresh. The boundary between *E. viscosa* and *E. tenella*, which has the inflorescences eglandular or with non-sticky glands, is not always sharp and intermediates are found. Similar to *E. arenicola*, which has the inflorescence contracted, and *E. ciliaris*, which has the lemma with long hairs on the keel.

Description: Chippindall & Crook 1976 (150), Clayton et al. 1970–1982 (206). Illustration: De Winter in Chippindall 1955 (fig. 155). Voucher: Muller 1298. PRECIS code 9902860-08900.

Eragrostis volkensis Pilg.

Perennial; densely tufted (with straggling matted wiry culms; often procumbent); 400–1200 mm tall. Leaf blades 20–80 mm long; 1–5 mm wide. Spikelets 3.5–7.0 mm long; 1.5–4.0 mm wide. Inflorescence sparsely branched, the primary branches stiffly spreading, pedicels short; spikelets olive-green, rachilla persistent, lemmas and/or paleas breaking up from the base upwards; glumes obtuse; lemma broadly ovate (in profile), lateral nerves indistinct; palea keels entire, winged, scaberrulous; anthers 3, 1 mm long; caryopsis narrowly ovate.

Flowering October to January. Damp soils in mountainous areas. Infrequent. Biome: Grassland. Northwards to east Africa, Cameroun and Zaire.

Description: Clayton et al. 1970–1982 (222). Voucher: De Winter & Codd 216, Kluge 439. PRECIS code 9902860-09000.

Eragrostis walteri Pilg.

Perennial; hydrophyte (occasionally), or tufted (with culms erect, semi-decumbent or floating); to 1140 mm tall (or long). Leaf blades to 100 mm long; to 4.5 mm wide. Spikelets to 7 mm long; 1.5–3.0 mm wide (excluding awns). Culms either straggling and matted or erect to geniculate and separate and not matted; inflorescence narrow, sparsely branched, branches spreading from or appressed to the main axis, pedicels short and the spikelets close together; spikelets light green to purple, granular, rachilla subsistent, fragile in the upper portion; glumes acuminate, upper glume tapering into a long, thick, awn-like, acuminate apex; lemma lanceolate, acute to acuminate in profile; palea margins not touching, keels flat, very broad in the lower 2/3, narrowing sharply to the apex and excurrent into a soft mucro; anthers 3, 0.6–1.0 mm long; caryopsis elliptic.

Flowering throughout the year. In damp, sandy and brackish soils around seepage areas or stagnant pools or in running water, especially that of springs and often associated with calcium carbonate. Locally common (only in a few specific moist areas). Biome: Nama-Karoo and Desert. Endemic. Ellis 1984 S. Afr. J. Bot. 3,6 (380) reports the first record for the sub-family Chloridoideae of non-Kranz leaf anatomy, which implies it utilizes the C₃ photosynthetic pathway.

Description: De Winter in Chippindall 1955 (176). Voucher: Giess 8104, Mueller 1285. PRECIS code 9902860-09100.

Eriochloa Kunth

Aglycia Steud., *Glandiloba* (Raf.) Steud., *Helopus* Trin., *Oedipachne* Link.

Annual, or perennial; long-stoloniferous, or caespitose to decumbent. Culms 200–1700 mm high; herbaceous; branched above, or unbranched above. Leaf blades usually flat. Ligule a fringed membrane (very reduced), or a fringe of hairs.

Inflorescence of spike-like main branches (of simple or compound racemes); open; spatheate. Spikelet-bearing axes persistent.

Spikelets solitary, or in pairs; consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations; supported on a peculiar, hardened, cupuliform 'callus'. Spikelets adaxial; compressed dorsiventrally; falling with the glumes. Glumes two (but G1 very modified); very unequal; awned (G2, when aristulate), or awnless; very dissimilar (the lower reduced to a small cupuliform strip adherent to the thickened rachilla internode). Proximal incomplete florets 1; paleate, or epaleate, palea when present fully developed to reduced; male, or sterile.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; rugose; becoming indurated, or not becoming indurated (papery to crustaceous); hairless (glabrous or apically puberulous); having the margins tucked in onto the palea; with a clear germination flap; 5 nerved; entire; mucronate to awned (the mucro or awn barbellate). Awns apical; non-geniculate; much shorter than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Photosynthetic pathway. C₄. The anatomical organization conventional. Biochemical type PCK (5 species); XyMS+. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicoideae; Paniceae. 30 species. Subtropical. Helophytic to mesophytic; in open habitats (damp ground and weedy places); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. 5 indigenous species.

References. 1, Gibbs Russell. 1980. Bothalia 13: 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Lower glume produced above beadlike swelling at base of spikelet; upper glume acute but not mucronate or awned 2
Lower glume apparently absent, adnate to beadlike swelling at base of spikelet; upper glume acuminate, mucronate or short-awned 3
- 2(1). Lower glume a short, truncate, in-turned cuff at base of spikelet
..... *E. meyeriana* subsp. *meyeriana*
Lower glume acute, 1/4–1/2 the length of the spikelet .. *E. meyeriana* subsp. *grandiglumis*
- 3(1). Spikelets 2.0–2.5 mm long; inflorescence branches few, appressed to main axis . *E. parvispiculata*
Spikelets (2.5–)3.0–5.0 mm long; inflorescence branches several to many, ascending, not appressed to main axis 4
- 4(3). Lower floret sterile, lacking a palea; plant annual
..... *E. fatmensis*
Lower floret staminate, with a palea almost as long as lemma; plant annual or perennial 5
- 5(4). Plant perennial, robust; spikelets 3–4 mm long; upper glume mucronate or with an awn-point to 1 mm long; upper lemma with mucro 0.3–0.7 mm long; Transvaal, Swaziland, Natal
..... *E. stapfiana*
Plant annual; spikelets 3.5–5.0 mm long; upper glume with an awn-point 1–3 mm long; Botswana *E. macclounii*



Fig. 93. *Eriochloa meyeriana* subsp. *meyeriana*

Eriochloa fatmensis (Hochst. & Steud.) Clayton

(= *E. nubica* (Steud.) Hack. & Stapf ex Thell.) 2.



Annual; 100–1200 mm tall (culms erect or geniculate). Leaf blades 30–300 mm long; 2–10 mm wide. Spikelets (2.5–)3.0–5.0 mm long. Inflorescence branches several to many, ascending; lower glume apparently absent, upper glume with a short awn; lower floret sterile; palea absent.

Flowering January to April. Wet places, usually on black clay, but also weedy by ephemeral water on other soils. Infrequent. Through tropical Africa and Arabia to India.

Description: Clayton et al. 1970–1982 (571). Voucher: Merxmüller & Giess 1560. PRECIS code 9901020–00050.

Eriochloa macclounii Stapf

Annual; tufted; to 1200 mm tall. Leaf blades 80–600 mm long; 3–12 mm wide. Spikelets 3.5–5.0 mm long. Inflorescence branches several to many, ascending; raceme rachises with long hairs; lower glume apparently absent; upper glume with an awn-point 1–3 mm long; lower floret staminate, with palea almost as long as lemma; female-fertile lemma with mucro 1–2 mm long.



Flowering April. Floodplain grassland. Rare (in southern Africa). Biome: Savanna. To Tanzania and Mozambique. Similar to the more robust *E. stapfiana*.

Description: Clayton et al. 1970–1982 (570). Voucher: P.A. Smith 4299. PRECIS code 9901020–00075.

Eriochloa meyeriana (Nees) Pilg. subsp. **grandiglumis**
(Stent & Rattray) Gibbs Russell

(=*Panicum meyerianum* Nees
var. *grandeglume* Stent &
Rattray) 1.

Perennial. Similar to the
typical subspecies but with the
lower glume acute, extending
1/4–1/2 the length of the spikelet.

Flowering October to June.
Lowveld riverbanks and floodplains. Rare. Biome: Savanna.
Also in Zimbabwe. Intergrades with subsp. *meyeriana*,
which has a shorter lower glume.

Description: Clayton et al. 1970–1982 (569). Voucher:
Codd 5421. PRECIS code 9901020–00095.

Eriochloa meyeriana (Nees) Pilg. subsp. **meyeriana**

(=*E. borumensis* sensu
Hack., non Stapf) 2; (=*Panicum*
meyerianum Nees var.
meyerianum) 2.

Robust perennial (culms geniculate, rooting at nodes below);
300–1500 mm tall. Leaf blades
50–250 mm long; 3–15 mm wide.
Spikelets 2.5–3.5 mm long. Lower glume produced above
the beadlike swelling as a short, truncate in-turned cuff;
upper glume acute, not mucronate or awned.

Flowering October to May. Riverbanks and wet places,
on sandy or clay soils. Locally common. Biome: Savanna.
To tropical Africa. Intergrades with both subsp.
grandiglumis and *E. stapfiana*.

Description: Clayton et al. 1970–1982 (569). Voucher:
De Winter & Codd 544. PRECIS code 9901020–00100.

Eriochloa parvispiculata C.E. Hubb.

Perennial; tufted; 300–1200
mm tall. Leaf blades 80–300 mm
long; 3–10 mm wide. Spikelets
2.0–2.5 mm long. Inflorescence
branches few, appressed to main
axis; lower glume apparently
absent; upper glume with a
mucro.

Flowering January to April.
Riverbanks and floodplain pans. Rare. Biome: Savanna. To
tropical east Africa. Intergrades with *E. stapfiana*, which
has longer spikelets; some specimens are difficult to
distinguish from the annual *E. fatmensis*.

Description: Clayton et al. 1970–1982 (570). Voucher:
Liebenberg 4390. PRECIS code 9901020–00300.

Eriochloa stapfiana Clayton

(=*E. borumensis* sensu Stapf,
non Hack.) 2.

Robust perennial; tufted;
600–1700 mm tall. Leaf blades
40–200 mm long; 3–8 mm wide.
Spikelets 3–4 mm long. Inflorescence
branches several to many,
ascending; raceme rachises with
short hairs; lower glume apparently absent; upper glume
mucronate or with an awn-point to 1 mm long; lower floret
staminate, with palea almost as long as lemma; female-
fertile lemma with mucro 0.3–0.7 mm long.

Flowering October to May. Riverbanks and wet places
on heavy soils. Infrequent. Biome: Savanna. To tropical
east Africa. Intergrades with *E. meyeriana* subsp. *meyeriana*,
which has a shorter mucronate tip on the upper lemma.

Description: Clayton et al. 1970–1982 (569). Voucher:
De Winter & Codd 552. PRECIS code 9901020–00400.

Eriochrysis P. Beauv.

Plazerium Kunth.

Perennial; caespitose. Culms 400–1200 mm high; herba-
ceous; unbranched above. Leaf blades linear; usually flat,
or folded (rarely). Ligule a fringed membrane, or a fringe
of hairs. Plants bisexual, with bisexual spikelets. The
spikelets of sexually distinct forms on the same plant; ho-
momorphic (but the pedicellate spikelets smaller).

Inflorescence of spike-like main branches (spiciform
'racemes', in a raceme or panicle, with tawny-red hairs);
contracted (narrow); non-digitate; espatheate; not com-
prising 'partial inflorescences' and foliar organs. Spikelet-
bearing axes 'racemes'; solitary; with substantial rachides;
disarticulating at the joints.

Spikelets in pairs; consistently in 'long-and-short' com-
binations; these pedicellate/sessile. Pedicels free of the
rachis. The sessile spikelets hermaphrodite. The pedicellate
spikelets female-only. Female-fertile spikelets compressed
dorsiventrally; falling with the glumes. Glumes two; more
or less equal; awnless; very dissimilar (G2 thinner, not 2-
keeled). Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the
glumes (hyaline); entire to incised (truncate to serrate);
awnless. Palea absent. Lodicules 2; fleshy; glabrous.
Stamens 3 (rudimentary in the pedicellate spikelets). Ovary
glabrous. Hilum short; embryo large.

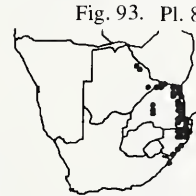


Fig. 93. Pl. 81.



Fig. 94. *Eriochrysis pallida*

Cytology, classification, distribution. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 7 species. Tropical America and tropical Africa. Helophytic; in open habitats (in swamps and moist places); glycophytic. Botswana, Transvaal, Swaziland, Natal, and Cape Province. 2 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Inflorescence hairs longer than the spikelets; sessile spikelets 3.5–5.0 mm long ***E. pallida***
 Inflorescence hairs shorter than the spikelets; sessile spikelets 5–6 mm long ***E. brachypogon***

***Eriochrysis brachypogon* (Stapf) Stapf**

(=*E. brachypogon* (Stapf) Stapf subsp. *australis* J.G. Anders.) 1.

Perennial; tufted; 600–900 mm tall. Leaf blades to 300 mm long; 1–3 mm wide. Spikelets (sessile) 5–6 mm long (pedicellate shorter). Golden callus hairs shorter than spikelets.

Flowering November to March. Vleis and riverbanks. Rare and conservation status not known. Biome: Grassland. Tropical Africa.

Description: Clayton et al. 1970–1982 (707). Illustration: Clayton et al. 1970–1982 (fig. 162). Voucher: Compton 30488. PRECIS code 9900420–00100.

***Eriochrysis pallida* Munro**

Fig. 94. Pl. 82.

Perennial; tufted; 400–900 mm tall. Leaf blades 100–240 mm long; 1–4 mm wide. Spikelets (sessile) 3.5–5.0 mm long (pedicellate shorter). Golden callus hairs longer than spikelets.

Flowering July to June. Vleis and riverbanks. Infrequent. Biome: Savanna. Tropical Africa.

Description: Chippindall 1955 (475), Clayton et al. 1970–1982 (706). Illustration: Chippindall 1955 (fig. 391). Voucher: Killick 251. PRECIS code 9900420–00200.

***Eulalia* Kunth**

Puliculum Haines.

Perennial (rarely annual); caespitose, or decumbent. Culms 100–1500 mm high; herbaceous; unbranched above. Leaf blades linear; flat. *Ligule an unfringed membrane, or a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets homomorphic.*

Inflorescence of spike-like main branches (very hairy or silky, often brown or purple); digitate or subdigitate (usually with a short axis); espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (spiciform); with very slender rachides; disarticulating at the joints. 'Articles' disarticulating obliquely.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets hermaphrodite. Female-fertile spikelets compressed dorsiventrally; falling with the glumes (the pedicellate falling from the pedicel, the sessile falling with the joint and pedicel). Glumes two; more or less equal;

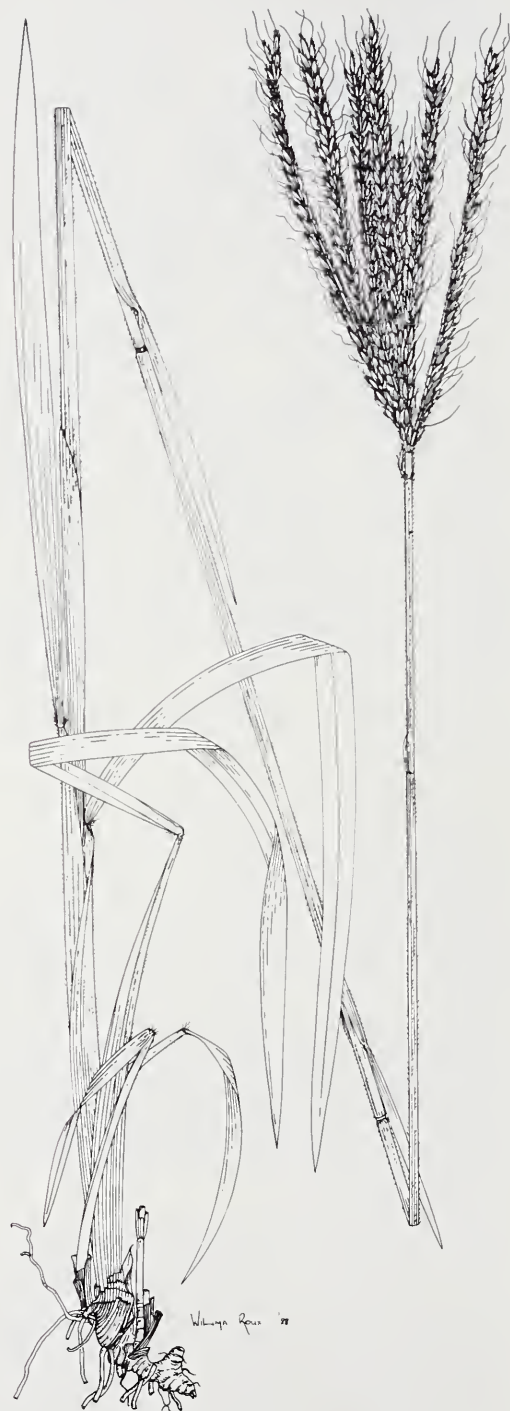


Fig. 95. *Eulalia villosa*

awned (rarely, G1 is bilobed or 2-awned), or awnless; very dissimilar (both villous, rigid to coriaceous; the lower flattened to depressed on the back and more or less bicarinate, the upper naviculate). Proximal incomplete florets present or absent; when present 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire, or incised; awned. Awns 1; from the sinus (usually); geniculate; much longer than the body of the lemma. Palea present, or absent; when present very reduced. Lodicules 2; fleshy; ciliate, or glabrous. Stamens 3 (rarely 2). Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 30 species. Tropical and subtropical Africa, Asia, Australia. Helophytic to mesophytic; in open habitats (grassland, sometimes in moist places); maritime-arenicolous (*E. ridleyi*), or glycophytic. Namibia, Botswana, Transvaal, Swaziland, Natal, and Cape Province. 2 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Hairs on racemes white; leaf sheaths hairy; spikelets 5–7 mm long; culms erect ***E. villosa***
 Hairs on racemes golden-brown; leaf sheaths glabrous; spikelets 3.5–4.0 mm long; culms often decumbent ***E. aurea***

***Eulalia aurea* (Bory) Kunth**

(=*E. geniculata* Stapf) 1.

Perennial; creeping rhizomatous; to 1000 mm tall. Leaf blades 30–150 mm long; 3–6 mm wide. Spikelets 3.5–4 mm long (sessile and pedicellate alike). Culms often decumbent; sheaths glabrous; raceme hairs golden-brown.



Flowering December to March. Riverbanks and floodplains. Infrequent. Biome: Savanna. Tropical Africa, Reunion and Australia.

Description: Chippindall 1955 (486), Clayton et al. 1970–1982 (713). Illustration: Chippindall 1955 (pl. 16). Voucher: De Winter & Marais 4484. PRECIS code 9900530–00150.

***Eulalia villosa* (Thunb.) Nees**

Perennial; tufted; 300–1400 mm tall. Leaf blades 50–250 mm long; 3–8 mm wide. Spikelets 5–7 mm long (sessile and pedicellate alike). Culms erect; sheaths hairy; raceme hairs white; lemma awns 15–20 mm long.



Fig. 95. Pl. 83.

Flowering September to May.

Open grassland on hillsides. Infrequent. Biome: Savanna and Grassland. Through eastern tropical Africa and Madagascar to India. Resembles hairy-leaved individuals of *Ischaemum fasciculatum* in the inflorescence form and reddish colour, but in that species the lemma awns are only about 5–10 mm long.

Description: Chippindall 1955 (485), Clayton et al. 1970–1982 (713). Illustration: Chippindall 1955 (fig. 397), Clayton et al. 1970–1982 (fig. 165). Voucher: Devenish 1282. PRECIS code 9900530–00200.

***Eustachys* Desv.**

Chloroides Regel, *Langsdorffia* Regel, *Schultesia* Spreng.

Perennial; caespitose. Culms 200–1000 mm high; herbaceous. Leaf blades linear; flat, or folded. *Ligule a fringe of hairs.*



Fig. 96. *Eustachys paspaloides*

Inflorescence of spike-like main branches (spikes or spicate racemes); digitate or subdigitate; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; 1.7–5 mm long; compressed laterally to not noticeably compressed; disarticulating above the glumes. *Glumes* two; relatively large (thinly membranous); very unequal, or more or less equal; decidedly shorter than the adjacent lemmas; *awned* (the upper only, from below its apex); very dissimilar (membranous, G2 broader and awned). Incomplete florets distal to the female-fertile florets (usually 2, greatly reduced), merely underdeveloped; *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (firmly membranous to papery, dark brown); 3 nerved; entire, or incised (notched); awnless, or mucronate. Palea present. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; ellipsoid; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C₄; NAD-ME (*distichophylla*); XyMS+. PCR sheath outlines uneven, or even. PCR sheath extensions absent. PCR cell chloroplasts centrifugal/peripheral, or centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 10 species. Tropical America, West Indies, tropical and South Africa. Mesophytic; in open habitats (savanna, on a variety of soils); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Eustachys paspaloides (Vahl) Lanza & Mattei

(= *E. mutica* auctt.) 1.

Red Rhodes grass, bruinhoeenderspoor.

Perennial; rhizomatous and tufted (erect or geniculately ascending); 200–950 mm tall. Leaf blades 20–180 mm long; 2–5 mm wide. Spikelets 1.5–2.5 mm long. Leaf sheaths strongly compressed, blades folded, with blunt apices; spikes (3–)4–10(–15), 50–150 mm long; spikelets golden-brown; lower glume ovate, boat-shaped; upper glume oblong-elliptic with awn 0.5–1.5 mm long; lemma 1.5–2.4 mm long, with or without a mucro up to 1 mm long.

Flowering October to May. Sandy and stony soils, occasionally on clay. Common. Biome: Fynbos, Savanna, and Grassland. Tropical Africa to Arabia. Very closely related to *Chloris*, from which it is distinguished by broader glumes, a short awn on the upper glumes and dark brown almost awnless female-fertile lemmas.

Description: Chippindall & Crook 1976 (23), Chippindall 1955 (194), Clayton et al. 1970–1982 (335). Illustration: Chippindall 1955 (fig. 170), Clayton et al. 1970–1982 (fig. 95). Voucher: Smook 3124. PRECIS code 9903020–00200.

Festuca L.

Amphigenes Janka, *Anatherum* Nabelek, *Argillochloa* Weber, *Bucetum* Parnell, *Drymochloa* Holub, *Drymonaetes* Fourr., *Festucaria* Fabric., *Gnomonia* Lunell, *Gramen* Krause, *Hellerochloa* Rauschert, *Hesperochloa* (Piper) Rydberg, *Leiopoa* Ohwi, *Lojaconoa* Gand., *Nabelekia* Roshev., *Pseudobromus* K. Schum., *Wasatchia* M.E. Jones.

Perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 20–2000 mm high; herbaceous; unbranched above. Sheath margins joined, or free.

Leaf blades linear to linear-lanceolate; narrow; flat, or folded, or rolled (convolute or involute). *Ligule* an unfringed membrane (sometimes ciliate).

Inflorescence paniculate; open, or contracted (rarely); espatheate. Spikelet-bearing axes persistent.

Spikelets not secund; 3–20 mm long; compressed laterally; disarticulating above the glumes. *Hairy callus* absent. *Glumes* two; very unequal; markedly shorter than the spikelets; awnless; similar (usually narrow to ovate-lanceolate). *Lower glume* 1 nerved. Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2–14 (rarely 1). Lemmas similar in texture to the glumes; *non-carinate*; 3–7 nerved; entire, or incised; awnless, or mucronate, or awned. Awns when present 1; from the sinus, or apical; non-geniculate; much shorter than the body of the lemma (usually), or about as long as the body of the lemma (sometimes — rarely somewhat longer). Palea present; relatively long. *Lodicules* 2; membranous; ciliate, or glabrous. Stamens 3. Ovary glabrous, or hairy. Fruit small, or medium sized, or large; fusiform, or ellipsoid; *hilum long-linear* (usually about as long as the grain, but sometimes elliptical and only half as long); embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Pooideae; Poaceae. 360 species (or more). Worldwide temperate & mountains. Helophytic (rarely), or mesophytic (mostly), or xerophytic (rarely); maritime-arenicolous, or halophytic, or glycophytic. Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (8), naturalized species (1).

Intergeneric hybrids with *Vulpia* (*X Festulpia* Melderis ex Stace & Cotton), with *Lolium* (*X Festulolium* Aschers. & Graebn.) and supposedly with *Bromus* (*X Bromofestuca* Prodan — *Bull. Grad. Bot. Univ. Club* 16, 93 (1936)).

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1985. Kew Bull. 40: 727. 3. Linder. 1986. Bothalia 16: 61. 4. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.

- 1(0). Spikelets 1-flowered with a prominent rachilla extension; lemma extending into an awn 10–20 mm long **F. africana**
- Spikelets 3–10-flowered, lacking a rachilla extension; lemmas acute or with an awn to 6 mm long ... 2
- 2(1). Panicle almost candelabrum-shaped, lowest branches about as long as the central axis; branches rigid, straight and bare, bearing a few spikelets near the tip **F. longipes**
- Panicle open or contracted, lowest branches less than half the length of the central axis; branches flexuous, either bare in the lower third or bearing spikelets from the base 3
- 3(2). Old leaf sheaths persistent, breaking into fibres and forming a dense protective layer around young shoots 4
- Old leaf sheaths not persistent or breaking into fibres 6
- 4(3). Leaf sheaths covered with velvety hairs at the base; base of culms bulbous or thickened; panicle dense, almost spike-like, branches rigid **F. scabra**
- Leaf sheaths glabrous; base of culms not bulbous or thickened; panicle open, branches flexuous ... 5
- 5(4). Leaf blades filiform, often inrolled, 0.2–2.0 mm wide; ligule shorter than 1 mm; basal fibres fine **F. caprina**
- Leaf blades expanded or inrolled, 3–10 mm wide; ligule 3–12 mm long; basal fibres coarse **F. costata**
- 6(3). Leaf auricles very well developed, to 5 mm wide .. **F. elatior**
- Leaf auricles absent or poorly developed, less than 1 mm wide 7

- 7(6). Lemma awned, awn 1–4 mm long; panicle branches flexuous, bearing fewer than 5 spikelets near the tip; leaves cauline **F. dracomontana**
 Lemma awnless or minutely awned; panicle branches fairly rigid, either bearing spikelets from the base or clustered at the tips; leaves basal or cauline 8
 8(7). Leaf blades inrolled, mostly basal; panicle pyramidal and open; branches with spikelets in the upper half **F. killickii**
 Leaf blades expanded, mostly cauline; panicle narrow and contracted; branches widely spaced, spikelets solitary on long pedicels along the central axis, with short branches bearing up to 3 spikelets scattered in between **F. vulpioides**

Fig. 97. *Festuca costata****Festuca africana* (Hack.) Clayton**

(=*Pseudobromus africanus* (Hack.) Stapf) 2;
 (=*Pseudobromus silvaticus* K. Schum.) 2.



Perennial; rhizomatous; 500–1200 (–1600) mm tall. Leaf blades 250–500 mm long; 8–15 mm wide. Spikelets 7–9 mm long. Leaves cauline; ligule to 8 mm long; panicle scanty, branches delicate and flexuous with spikelets solitary at the tips; spikelets 1-flowered with a prominent rachilla extension and a rudimentary floret; glumes unequal; lemma extending into a long straight awn 10–20 mm long.

Flowering January to April (occasionally in other months). Open patches in forests, usually in the shade. Infrequent. Biome: Forest. Northwards to Kenya. Easily confused with another forest species, *Stipa dregeana*, which has glumes equal and longer than the lemmas and lemmas hairy with a bent and twisted awn. Distinguished from other South African *Festuca* species, which have spikelets 3–9-flowered and usually lack a rachilla extension.

Description: Linder (15), Stapf 1898–1900 (763), Chippindall 1955 (61). Illustration: Chippindall 1955 (fig. 34). Voucher: Schweickerdt 1563. PRECIS code 9904170–00075.

***Festuca caprina* Nees**

Bokbaardgras.



Perennial; rhizomatous and tufted (densely); 250–1000 mm tall. Leaf blades 40–250 mm long; filiform, to 1.5 mm wide. Spikelets 7–15 mm long. Old leaf sheaths persisting as fine fibres; ligule shorter than 1 mm; leaves usually not more than half the culm length; panicle open, lax, 50–200 mm long; spikelets 4–6 (–9)-flowered; lemmas awned, awn 1–4 mm long.

Flowering September to March. Moist or wet areas near vleis in high altitude mountain grassveld. Common to locally dominant. Biome: Grassland and Afromontane. Northwards to Tanzania. Closely related to *F. scabra*, which has flat leaf blades, an almost spikelike panicle and swollen culm bases, and to *F. costata*, which has expanded or inrolled leaf blades, a longer ligule and coarse sheath fibres. The different varieties previously recognized are not upheld because of the variability in the species.

Description: Linder (13), Stapf 1898–1900 (719), Chippindall 1955 (55), Clayton et al. 1970–1982 (62). Illustration: Chippindall 1955 (fig. 25). Voucher: Hoener 2114. PRECIS code 9904170–00200.

***Festuca costata* Nees**

Fig. 97. Pl. 85.

Tussock fescue, polswenkgras.



Tough, erect perennial; rhizomatous (rhizome short and stout or long and deeply burrowed); 600–1700 mm tall. Leaf blades 700–1000 mm long; 3.5–6.0 mm wide. Spikelets 10–20 mm long. Leaf sheaths persistent, breaking into coarse fibres that form a protective layer around the young shoots; ligules 3–12 mm long; panicle open, 120–240 mm long; spikelets 3–7-flowered; lemma acute or minutely awned.

Flowering September to January. Moist places in high altitude mountain grassland, encouraged by frequent burning. Common to locally dominant. Biome: Afromontane Grassland. Endemic. Closely related to *F. caprina*, which

has filiform leaf blades and fine sheath fibres, and to *F. scabra*, which has bulbous culm bases, velvet-hairy leaf sheaths and a dense, almost spikelike, panicle. The different varieties previously recognized are not upheld because of the variability in the species.

Description: Chippindall & Crook (210), Linder (11), Stapf 1898–1900 (721), Chippindall 1955 (56), Clayton et al. 1970–1982 (59). Illustration: Chippindall 1955 (fig. 28). Voucher: Mohle 47. PRECIS code 9904170–00500.

Festuca dracomontana Linder

Perennial; rhizomatous; 500–800 mm tall. Leaf blades 80–200 mm long; 2–8 mm wide. Spikelets 10–12 mm long. Leaves cauline, blades expanded; ligules shorter than 1 mm; panicle open, to 250 mm long, branches flexuous, bare for the longest part, with 1–5 spikelets near the tips; spikelets 3–7-flowered; lemmas awned, awn 2–4 mm long.

Flowering October. Sour grassveld in high mountains. Rare. Biome: Grassland. Endemic.

Description: Linder 1986 Bothalia 16,1 (59). Voucher: Du Toit 2714. PRECIS code 9904170–00725.

Festuca elatior L.

(=*F. arundinacea* Schreb.) 3.

Meadow fescue, English bluegrass.

Perennial; rhizomatous and tufted; 800–2000 mm tall. Leaf blades 100–600 mm long; 3–12 mm wide. Spikelets 10–18 mm long. Leaf sheaths not breaking into fibres, sheaths glabrous; leaf auricles well developed, to 5 mm wide; ligules to 2 mm long; panicle lanceolate to ovate, 100–500 mm long, nodding; spikelets 3–10-flowered; lemmas acute or awned, awn to 4 mm long.

Flowering September to April. Disturbed places near streams, reservoirs and on roadsides. Infrequent. Naturalized from Europe and temperate Asia. Biome: Fynbos to Grassland. Widely introduced to tropical countries. Winter pasture (and in experimental cultivation). The unusually large leaf auricles are unique for the southern African *Festuca* species.

Description: Bor 1985 (1730), Hitchcock & Chase 1950 (168), Chippindall 1955 (56), Clayton et al. 1970–1982 (58). Illustration: Chippindall 1955 (fig. 27). Hitchcock & Chase 1950 (fig. 78). Voucher: Smook 5977. PRECIS code 9904170–00750.

Festuca killickii K.-O'Byrne

Erect, coarse perennial; rhizomatous and tufted; 500–950 mm tall. Leaf blades erect, 200–600 mm long; inrolled, 3–6 mm wide. Spikelets 6–9 mm long. Leaves and sheaths glabrous; ligules 2–3(–4) mm long; panicle pyramidal, to 200 mm long, 20–60 mm wide, branches bare for lower half; spikelets shortly pedicelled, 4–6-flowered; lemmas acute or with awn shorter than 0.5 mm.

Flowering December to February. Subalpine grassveld at high altitudes up to 3000 m, on Cave sandstone and basalt, amongst boulders, along streams and on ledges. Locally common to locally dominant. Biome: Grassland. Endemic.

Description: Kennedy-O'Byrne 1963 Kew Bull. 16,1 (461), Linder (13). Illustration: Kennedy-O'Byrne 1963 (fig. 1). Voucher: Du Toit 2320. PRECIS code 9904170–00800.

Festuca longipes Stapf

Perennial; rhizomatous (rhizome long and slender); 300–750 mm tall. Leaf blades 100–300 mm long; 2–6 mm wide. Spikelets 8–12 mm long. Ligules 2–3 mm long; panicle almost candelabrum-shaped, 150–330 mm long, branches rigid, flattened on the inner side, borne in remote pairs, unbranched and bare for most of their length, bearing 1–6 spikelets at the tips, lower branches almost as long as the central axis; spikelets closely 3–6-flowered; glumes and lemmas awnless.

Flowering November to April. Moderate to steep grassy slopes and sandstone ridges, often on the edges of forests in partial shade, at altitudes higher than 1500 m. Infrequent. Biome: Grassland. Endemic. The shape of the panicle distinguishes this species from other South African *Festuca* species, which have open or contracted panicles with branches flexuous and less than half the length of the central axis.

Description: Linder (10), Stapf 1898–1900 (721), Chippindall 1955 (58). Voucher: Mullins PRE 56847. PRECIS code 9904170–00900.

Festuca scabra Vahl

Munnik fescue, Munnik swenkgras.

Perennial; rhizomatous (rhizome long or oblique); 300–1000 mm tall. Leaf blades 50–300 mm long; inrolled or expanded and to 10 mm wide. Spikelets 7–15 mm long. Plants dioecious; culm base bulbous at maturity; leaf sheaths velvet-hairy at the base, old sheaths splitting into fine fibres; ligules 2–7 mm long; panicle 50–300 mm long, 10–30 mm wide, narrow, contracted, sometimes spike-like or interrupted; spikelets 3–7-flowered; lemmas awnless or minutely awned.

Flowering September to February. Sandy soils in undisturbed, high altitude mountain grassveld and extending into Valley Bushveld, often in moist places and partial shade, stimulated by fire. Common to locally dominant. Biome: Fynbos, Savanna, Grassland, and Succulent Karoo. Endemic. Well eaten natural or cultivated pasture. Morphologically very variable. If the bulbous culm bases and fibrous leaf sheaths are not distinct in young plants, it can be distinguished by the velvet-hairy basal part of the leaf sheaths. Very closely related to *F. caprina* and *F. costata*, which have glabrous leaf sheaths and open lax panicles.

Description: Linder (8), Stapf 1898–1900 (722), Chippindall 1955 (56). Illustration: Chippindall 1955 (fig. 26). Voucher: Hoener 1923. PRECIS code 9904170–01000.

Festuca vulpioides Steud.

Perennial; tufted (or sprawling); 500–1000 mm tall. Leaf blades 100–250 mm long; 3–7 mm wide. Spikelets 15–20 mm long. Leaf blades cauline, expanded; ligules shorter than 1 mm; panicle narrow, to 300 mm long; spikelets borne either solitary on long pedicels or on short branches with up to five widely spaced spikelets; spikelets 5–8-flowered; lemmas acute or minutely awned.

Flowering January. Scattered tufts at high altitudes in the Dohne Sourveld. Rare. Locally common. Biome: Grassland. Endemic. The only *F. vulpioides* specimen at PRE, Acocks 20228, has much smaller spikelets, 8–14 mm, than the length given for this species.



Description: Linder (6), Stapf 1898–1900 (720). Voucher: Acocks 20228. PRECIS code 9904170–01100.

Fingerhuthia Nees *Lasiostrichos* Lehm.

Perennial (or rarely annual in desert areas); caespitose. Culms 50–1170 mm high; herbaceous; unbranched above. Leaf blades long linear; flat, or folded. *Ligule a fringe of hairs*. The spikelets of sexually distinct forms on the same plant (the lowest spikelets sometimes barren), or all alike in sexuality.

Inflorescence a single raceme, or panicle (to 120 mm long); densely contracted; espathate. Spikelet-bearing axes persistent.

Female-fertile spikelets solitary; 4–7 mm long; compressed laterally (strongly); *falling with the glumes (disarticulating from persistent pedicels)*; not disarticulating between the florets. Glumes two; more or less equal; much exceeding the spikelets; awned, or awnless (shortly awned or mucronate); similar (narrow, folded, thin). Incomplete florets distal to the female-fertile florets, merely underdeveloped (male or rudimentary); *incomplete florets absent*.

Female-fertile florets 1. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (rather firm); without a germination flap; 5 nerved, or 7 nerved (rarely 3 nerved); entire; mucronate (median nerve excurrent). Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit ellipsoid.

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 2 species. Southern Africa, Afghanistan and Arabia. Helophytic, or mesophytic, or xerophytic; in open habitats; glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.

- 1(0). Glumes with keels densely hairy; lemma tips rounded; plant base not robust; rhizomes slender; basal leaf sheaths dull; growing in well-drained soils

F. africana

- Glumes with keels sparsely hairy; lemma tips acuminate; plant base robust; rhizomes very well developed; basal leaf sheaths glossy; growing in waterlogged and poorly-drained soils

F. sesleriiformis

Fingerhuthia africana Lehm.

Vingerhoedgras, thimble grass.

Perennial (sometimes annual); rhizomatous; 100–910 mm tall. Leaf blades 25–400 mm long; 2–4 mm wide. Spikelets 4.0–5.5 mm long. Panicle spike-like, 15–50 mm long; glumes with stiff dense hairs on the keels; lemma apex rounded.

Flowering September to May. Well-drained sandy or gravelly soils, often on limestone outcrops. Common. Biome: Savanna, Grassland, Nama-Karoo, Succulent Karoo, and Desert. Disjunct distribution between the FSA area and Afghanistan and Arabia. Pasture.



Fig. 98. Pl. 86.

Description: Stapf 1898–1900 (691), Chippindall 1955 (207). Illustration: Chippindall 1955 (fig. 184 (spikelet)). Voucher: Smook 2887. PRECIS code 9903710–00100.

Fingerhuthia sesleriiformis Nees

Vingerhoedgras, thimble grass.

Perennial; rhizomatous and tufted (forming large tussocks); 300–1170 mm tall. Leaf blades 120–240 mm long; 3–5 mm wide. Spikelets 5–6 mm long. Rhizomes robust and well developed; panicle spike-like, to 80 mm long; glumes sparsely hairy on the keels; lemma apex acuminate.

Flowering November to April. Black clay in vleis or clayey soils near rivers. Common (often in dense, pure stands). Biome: Savanna, Grassland, and Nama-Karoo. Endemic. Erosion control, or pasture, or domestic use (brooms).

Description: Stapf 1898–1900 (692), Chippindall 1955 (207). Illustration: Chippindall 1955 (fig. 183). Voucher: Smook 5886. PRECIS code 9903710–00200.

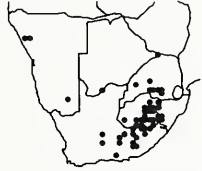


Fig. 98. *Fingerhuthia africana*

Gastridium P. Beauv.

Annual; caespitose (or solitary culms). Culms 100–600 mm high; herbaceous. Leaf blades linear; flat. *Ligule an unfringed membrane*.

Inflorescence paniculate; contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 3–6.5 mm long; compressed laterally; *disarticulating above the glumes*. *Glumes* two (swollen, globular and more or less cartilaginous at the base, membranous above); relatively large; more or less equal (the lower somewhat longer); long relative to the adjacent lemmas; *conspicuously ventricose*; awnless; similar. *All florets female-fertile*; *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas less firm than the



Fig. 99. *Gastridium phleoides*

glumes; 5 nerved; incised (more or less dentate); mucronate to awned (the midvein usually excurrent). Awns when present 1; dorsal; geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. 2 species. Canaries, western Europe, Mediterranean. Mesophytic to xerophytic; in open habitats (grassy places and arable land). Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by G.E. Gibbs Russell.

Gastridium phleoides (Nees & Meyen) C.E. Hubb.

Fig. 99. Pl. 87.

Annual; 100–600 mm tall. Leaf blades to 15 mm long; 1–4 mm wide. Spikelets 5–7 mm long. Glumes swollen at base around floret; panicle narrow and spike-like.

Flowering October to December. Open veld. Rare. Naturalized from the Mediterranean. Biome: Fynbos. Widely introduced, originally from north Africa and the Mediterranean region. Only known from Cape Town, Stellenbosch and Wellington.

Description: Chippindall 1955 (96), Clayton et al. 1970–1982 (100). Illustration: Chippindall 1955 (fig. 67), Clayton et al. 1970–1982 (fig. 34). Voucher: Loxton 237. PRECIS code 9902480-00100.



Hackelochloa Kuntze

Sometimes included in *Rytidix*.

Annual; caespitose. Culms (50–)300–1000 mm high; herbaceous; branched above. *Leaf blades linear-lanceolate*; flat. *Ligule a fringed membrane*. Plants *bisexual*, with *bisexual spikelets*. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (the pedicellate spikelets narrowly ovate and winged, herbaceous).

Inflorescence paniculate (the numerous 'racemes' solitary in their spathes, usually in fascicles); *spatheate*; a complex of 'partial inflorescences' and intervening foliar organs; spikelet-bearing axes spike-like; with substantial rachides; disarticulating at the joints (the sessile spikelets falling with the joint and the pedicellate spikelet). 'Articles' with a basal callus-knob.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. *Pedicels of the 'pedicellate' spikelets discernible, but fused with the rachis*. The sessile spikelets hermaphrodite. The 'pedicellate' spikelets hermaphrodite (the glumes herbaceous, similar; lower lemma present or absent), or male-only, or sterile. Female-fertile spikelets 1–3 mm long; compressed dorsiventrally (to globose); falling with the glumes. Glumes two; relatively large; difference in glume length not great, but G2 hooded by G1; awnless; very dissimilar (lower cartilaginous, globose, reticulate-pitted; upper thinner and embedded in the axis). *Proximal incomplete florets* 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline, flimsy); entire; awnless. Palea present, or absent; when present relatively long, or conspicuous but relatively short, or very reduced. Lodicules fleshy. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 7$ (?). Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. 2 species. Tropics, southern China and southern U.S.A. Helophytic to mesophytic; in open habitats (grassland and disturbed ground); glycophytic. Transvaal. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA. 3. Veldkamp. 1986. Blumea 31: 281.

Species could be transferred to *Mnesithea* Kunth.

Species treatment by G.E. Gibbs Russell.

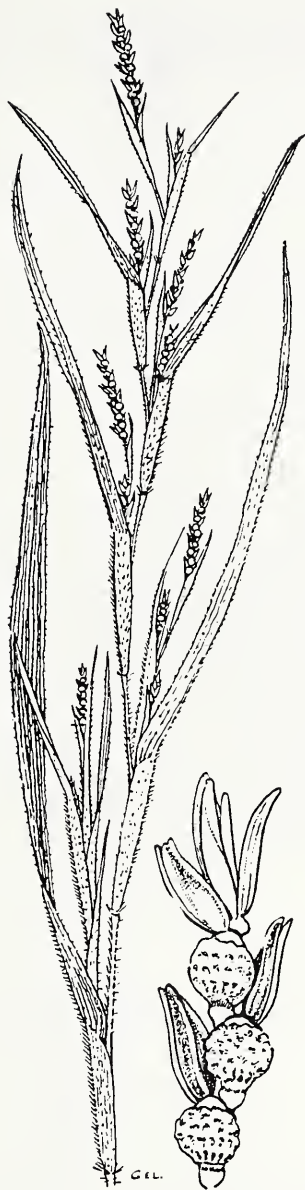
Hainardia Greuter*Monerma* auctt., non (Willd.) Coss & Dur.

Annual; caespitose. Culms 50–400 mm high; herbaceous; branched above. Sheath margins free. Leaf blades linear; flat, or rolled (convolute). Ligule an unfringed membrane.

Inflorescence a single spike (with a hard, cylindrical, articulated rachis, the spikelets embedded in alternate notches); espatheate. Spikelet-bearing axes disarticulating; disarticulating at the joints.

Spikelets solitary; distichous; 4–8 mm long; compressed dorsiventrally; falling with the glumes. Glumes one per spikelet (the G2); relatively large (firm); long relative to the adjacent lemmas; awnless. All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas less firm than the glumes (membranous); 3 nerved; entire; awnless. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 1–3. Ovary glabrous. Fruit small; hilum short; embryo small.

Fig. 100. *Hackelochloa granularis***Hackelochloa granularis** (L.) Kuntze

Lizardtail grass.

Annual; 50–1000 mm tall. Leaf blades 20–150 mm long; 6–12 mm wide. Spikelets (sessile) 1.0–1.5 mm long (pedicellate slightly longer). Sessile spikelet globose, lower glume pitted and tuberculate.

Flowering March to April. Disturbed places. Rare (in South Africa). Throughout tropics. Weed (ruderal in the tropics).

Description: Chippindall 1955 (523), Clayton et al. 1970–1982 (849). Illustration: Chippindall 1955 (fig. 418), Clayton et al. 1970–1982 (fig. 200). Voucher: Parker 8–4–1959. PRECIS code 9900220–00100.



Fig. 100. Pl. 88.

Fig. 101. *Hainardia cylindrica*

Cytology, classification, distribution. Chromosome base number, $x = 13$. Pooideae; Poodae; Poeae. 1 species. Mediterranean to Iraq. Mesophytic; in open habitats (meadows, etc., often coastal). Cape Province. 1 naturalized species.

References. 1. Greuter. 1967. Boissiera 13: 178. 2. Clayton & Renvoize. 1986. Gen. Gram.

Species treatment by G.E. Gibbs Russell.

Hainardia cylindrica (Willd.) Greuter

(=*Monerma cylindrica* auctt., non (Willd.) Coss & Dur.) 1,2.

Fig. 101. Pl. 89.

Erect annual; 50–350 mm tall. Leaf blades to 7 mm long; to 2.5 mm wide. Spikelets 5–8 mm long. Spikes cylindrical, solitary; spikelets sunk in the rachis, with one glume and one floret.



Flowering November to December. Weedy in moist places. Rare. Naturalized from southern Europe. Biome: Fynbos. Mediterranean. Weed. Similar to *Parapholis incurva*, which has two glumes, *Lepturus repens*, which is a stoloniferous perennial, and *Lolium rigidum*, which has several florets per spikelet.

Description: Chippindall 1955 (73). Illustration: Chippindall 1955 (fig. 45). Voucher: Adamson 3309. PRECIS code 9904423-00100.

Harpochloa Kunth

Perennial; densely caespitose. Culms 300–900 mm high; herbaceous; unbranched above. Leaf blades stiffly linear; flat, or rolled. *Ligule a fringed membrane*.

Inflorescence a single spike (very rarely two); usually non-digitate; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; alternately biseriate (along the midrib of the rachis); 6–7 mm long; *compressed laterally (darkly pigmented)*; disarticulating above the glumes; not disarticulating between the florets. Glumes two (dark grey-green); very unequal (G2 much larger); about equalling the spikelets (i.e. the upper glumes); awnless; very dissimilar (G1 smaller, 1-keeled, thinner. G2 2-keeled, firm). Incomplete florets distal to the female-fertile florets (the second and third male, the fourth if present sterile, these all enclosed in the lemma of the lower male floret and not exceeding the L1), merely underdeveloped, awnless; *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas similar in texture to the glumes (firmly membranous); without a germination flap; 3 nerved; entire; awnless. Palea present (hairy near tip); relatively long. Lodicules fleshy (winged); glabrous. Stamens 3 (in hermaphrodite and male florets). Ovary glabrous. Fruit small (3 mm); ellipsoid; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C_4 ; XyMS+. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 1 species. Southern Africa. Mesophytic; in open habitats (grassland); glycophytic. Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.



Fig. 102. *Harpochloa falx*

Harpochloa falx (L. f.) Kuntze

Ruspergras, caterpillar grass.

Fig. 102. Pl. 90.

Perennial; distinctly rhizomatous and tufted (densely); 400–900 mm tall. Leaf blades 100–250 mm long; often inrolled, 2–4(–6) mm wide. Spikelets 6–9 mm long. Solitary one-sided, 'toothbrush' spikes, up to 80 mm long and 10 mm wide, sickle-shaped at maturity; spikelets in two rows, 3–4-flowered.

Flowering September to April. Stony well-drained to compacted soils on moist slopes. Common (often in large dense stands). Biome: Fynbos, Savanna, and Grassland. Pasture (highly palatable).



Description: Chippindall 1955 (191). Illustration: Chippindall 1955 (fig. 166). Voucher: Van Wyk & Theron 4706. PRECIS code 9902980-00100.

Helictotrichon Schult.

Avenochloa Holub, *Avenula* (Dumort.) Dumort., *Danthorhiza* Ten., *Heuffelia* Schur.

Perennial; caespitose. Culms 150–1500 mm high; herbaceous; unbranched above. Leaf blades linear; flat, or folded, or rolled (convolute). *Ligule* an *unfringed membrane* (sometimes *puberulent*).

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets 8–25 mm long; *compressed laterally*; disarticulating above the glumes. *Callus pointed, hairy*. *Glumes* two; *very unequal, or more or less equal*; *decidedly shorter than the adjacent lemmas*; awnless; *similar* (persistent, hyaline to scarious or firm & herbaceous). *Incomplete florets distal to the female-fertile florets, merely undeveloped, awned*; *proximal incomplete florets absent*.

Female-fertile florets 2–7. *Lemmas* decidedly firmer than the glumes; *non-carinate* (dorsally rounded); 5–7 nerved; incised (usually bidentate); awned. Awns 1; median; dorsal; geniculate; much longer than the body of the lemma (always?). *Palearia* present; relatively long. *Lodicules* 2; membranous; glabrous. *Stamens* 3. *Ovary* hairy. *Fruit* medium sized; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. About 90 species. Europe, Africa, Southeast Asia, North & South America. Mesophytic to xerophytic, or helophytic (rarely); mostly in open habitats (dry hillsides, meadows, margins of woods). Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 13 indigenous species.

References. 1. Schweickerdt. 1937. Bothalia. 3, 2. 2. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.

- 1(0). Rachilla internodes glabrous **H. leoninum**
Rachilla internodes sparsely or densely hairy 2
- 2(1). Rachilla internodes 2.5–4.5 mm long; spikelets usually loosely flowered 3
Rachilla internodes to 2.3 mm long; spikelets usually closely flowered (if loosely flowered then leaves setaceous) 6
- 3(2). Leaves setaceous; panicle open; spikelets fewer than 20 **H. sp. (=Ellis 4663)**
Leaves flat; panicle lax or contracted; spikelets more than 20 4
- 4(3). Panicles 150–300 mm long, linear; upper glume shorter than half the spikelet length; spikelets 15–30 mm long **H. longum**
Panicles 60–120 mm long, oblong or ovate; upper glume longer than half the spikelet length, spikelets 10–17 mm long 5
- 5(4). Lemmas coarsely granular and scabrid below the insertion of the awn; plants about 300 mm tall **H. namaquense**
Lemmas smooth below the insertion of the awn; plants about 800 mm tall **H. barbatum**
- 6(2). Lemmas scabrid or scaberulous 7
Lemmas glabrous 9
- 7(6). Glumes almost equal and as long as the spikelet, broadly lanceolate, almost enclosing the spikelet, usually scabrous especially on the nerves; leaves usually woolly-hairy **H. galpinii**
Glumes unequal to subequal, upper glume 2/3 the spikelet length, narrowly lanceolate, glabrous; leaves usually glabrous 8

- 8(7). Lemmas about 7 mm long; rachilla internodes 1.5 mm long **H. hirtulum**
Lemmas about 10 mm long; rachilla internodes 2.0 mm long **H. capense**
- 9(6). Lemmas shorter than 7 mm, nerves usually raised **H. natalense**
Lemmas longer than 7 mm, nerves usually inconspicuous 10
- 10(9). Spikelets 12–15 mm long; lemma lobes above the insertion of the awn 6–8 mm long; panicle usually very dense and contracted, spikelets yellowish **H. dodii**
Spikelets 8–12 mm long; lemma lobes above the insertion of the awn 3–5 mm long; panicle lax, open or slightly contracted; spikelets green, often variegated with purple 11
- 11(10). Leaves setaceous, 200–400 mm long; rachilla hairs 3–4 mm long; spikelets loosely flowered, with the rachilla usually exposed between the florets **H. longifolium**
Leaves flat, 60–150 mm long; rachilla hairs 2 mm long; spikelets closely flowered, with the rachilla usually not showing **H. turgidulum**

Helictotrichon barbatum (Nees) Schweick.

Perennial; densely tufted; 600–800 mm tall. Leaf blades 150–320 mm long; 1.5–3.5 mm wide. Spikelets 14–17 mm long. Leaves flat; panicle 80–100 mm long, oblong, lax; upper glume longer than 1/2 the spikelet; rachilla internodes bearded, 3.0–3.5 mm long; lemmas smooth below the insertion of the awn.



Flowering November. Lower mountain slopes. Very rare. Biome: Succulent Karoo. Endemic. Known from two localities only: Kamiesberg and Hantamberge in the western Cape.

Description: Schweickerdt 1937 (190), Chippindall 1955 (78). Illustration: Chippindall 1955 (fig. 48(8)). Voucher: Acocks 18632. PRECIS code 9901970-00100.

Helictotrichon capense Schweick.

Perennial; tufted; to 1000 mm tall. Leaf blades to 250 mm long; 1–2 mm wide. Spikelets about 15 mm long. Leaf blades filiform, expanded; panicle to 200 mm long; upper glume 2/3 the spikelet length; rachilla internodes 2 mm long; lemma scabrous, about 10 mm long.



Flowering November, December, and May. Sandy soils, occasionally in disturbed places. Infrequent. Biome: Fynbos and Savanna. Endemic. A poorly defined species, which is usually larger than *H. hirtulum* in all dimensions.

Description: Schweickerdt 1937 (193), Chippindall 1955 (78). Illustration: Chippindall 1955 (fig. 48(3) & 49). Voucher: Sim 2803. PRECIS code 9901970-00200.

Helictotrichon dodii (Stapf) Schweick.

Perennial; tufted; 500–1000 (–1250) mm tall. Leaf blades 300–500 mm long; 3–5 mm wide. Spikelets 12–15 mm long. Leaf blades flat; panicle 120–300 mm long, narrow, contracted, usually dense; glumes lanceolate, upper glume 2/3 the spikelet length; rachilla internodes 2 mm long,



with hairs 3.0–3.5 mm long; lemmas glabrous, linear in outline, lobes delicately awned, 6–8 mm long.

Flowering sporadic, but mainly October to December. On coastal sandflats, disturbed places and vle margins. Infrequent. Biome: Fynbos and Grassland. Endemic. The very dense, contracted panicle and long lemma lobes (which give a delicate, slender appearance), make this a very well defined species. Related to *H. turgidulum*, which has shorter lemma lobes, to *H. natalense*, which has shorter

spikelets, and to *H. longifolium*, which has setaceous leaf blades.

Description: Schweickerdt 1937 (197), Stapf 1898–1900 (475), Chippindall 1955 (79). Illustration: Chippindall 1955 (fig. 48(12)). Voucher: Pole Evans 518. PRECIS code 9901970–00300.

Helictotrichon galpinii Schweick.

Perennial; tufted; to 600 mm tall. Leaf blades 120–160 mm long; 2.5–3.0 mm wide. Spikelets 8–10 mm long. Leaves expanded, hairy; panicle 100–160 mm long, contracted; glumes almost equal, broadly lanceolate, as long as the spikelet; rachilla internodes 1.25 mm long, hairy; lemmas covered with papillae and prickles.



Flowering January to March. On humic soils in wet places. Infrequent. Biome: Grassland. Endemic. Readily distinguished by the broad glumes that are as long as the spikelets and the scabrid lemmas.

Description: Schweickerdt 1937 (192), Chippindall 1955 (78). Illustration: Chippindall 1955 (fig. 48(10)). Voucher: P.C.V. du Toit 2311. PRECIS code 9901970–00400.

Helictotrichon hirtulum (Steud.) Schweick.

Fig. 103.

Slender, weak perennial; loosely tufted; to 1000 mm tall. Leaf blades to 250 mm long; filiform, to 2 mm wide. Spikelets 8–11 mm long. Panicle lax, almost spike-like, to 200 mm long; glumes unequal, upper to 2/3 the spikelet length; rachilla internodes 1.5–2.0 mm long, with hairs to 2 mm long; lemma scabrid below the insertion of the awn.



Flowering November to March. On mountain slopes, often in shady, wet places and also in disturbed areas. Infrequent to locally common. Biome: Fynbos, Savanna, Grassland and Nama-Karoo. Endemic. Very similar to *H. capense*, which normally is a larger, more robust plant.

Description: Schweickerdt 1937 (193), Chippindall 1955 (78). Illustration: Chippindall 1955 (fig. 48(2)). Voucher: Sim 2803. PRECIS code 9901970–00500.

Helictotrichon leoninum (Steud.) Schweick.

Perennial; loosely to fairly densely tufted; 150–450 (–650) mm tall. Leaf blades 40–100 (–180) mm long; filiform, to 4 mm wide. Spikelets 12–14 mm long. Leaf blades flat; panicle 60–100 mm long, linear, contracted; upper glume about 1/2 the spikelet length; rachilla internodes glabrous, 1.5–2.0 mm long; lemmas very densely papillose.



Flowering August to November. On mountain slopes, along mountain roads and in humic seepage areas. Infrequent. Biome: Fynbos. Endemic. This is the only southern African *Helictotrichon* species with glabrous rachilla internodes, but one should be careful that the hairs on the densely tufted callus are not mistaken for rachilla hairs.

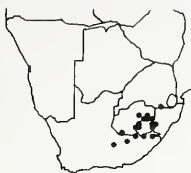
Description: Schweickerdt 1937 (191), Chippindall 1955 (78). Illustration: Chippindall 1955 (fig. 48(6)). Voucher: P.C.V. du Toit 1419. PRECIS code 9901970–00600.



Fig. 103. *Helictotrichon hirtulum*

***Helictotrichon longifolium* (Nees) Schweick.**

Perennial; tufted; 300–900 mm tall. Leaf blades 200–400 mm long; setaceous, to 1.5 mm wide. Spikelets 8–10(–12) mm long. Panicle to 200 mm long, usually open; upper glume about 3/4 the spikelet length; rachilla internodes about 2 mm long, with hairs 3–4 mm long; lemma smooth or finely papillate, lobes above the insertion of the awn shorter than 7 mm.

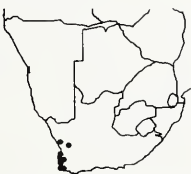


Flowering December to April. On moist and rocky mountain slopes. Locally common. Biome: Grassland and Nama-Karoo. Endemic. Very closely related to *H. dodii*, which has flat leaf blades and longer spikelets, to *H. turgidulum*, which has shorter rachilla hairs and flat leaf blades, and to *H. natalense*, which has shorter spikelets.

Description: Schweickerdt 1937 (195), Stapf 1898–1900 (477), Chippindall 1955 (79). Illustration: Chippindall 1955 (fig. 48(1)). Voucher: De Wet 1722. PRECIS code 9901970–01000.

***Helictotrichon longum* (Stapf) Schweick.**

Perennial; long rhizomatous and tufted (with new shoots spreading for a short distance underground before emergence); 600–1100(–1600) mm tall. Leaf blades 150–300(–400) mm long; 2.5–10 mm wide. Spikelets 15–30 mm long. Leaves flat; panicle 150–300 mm long, linear, usually contracted; upper glume shorter than 1/2 the spikelet; rachilla internodes 2.5–3.0 mm long, bearded; lemmas minutely granular below the insertion of the awn.



Flowering September to November. Sandy flats in coastal fynbos, occasionally in moist areas. Infrequent. Biome: Fynbos. Endemic. A very distinct tall plant with flat, wide leaf blades and a long panicle with notably long spikelets.

Description: Schweickerdt 1937 (189), Stapf 1898–1900 (473), Chippindall 1955 (77). Illustration: Chippindall 1955 (fig. 48(5)). Voucher: Acocks 19730. PRECIS code 9901970–00800.

***Helictotrichon namaquense* Schweick.**

Perennial; densely tufted; 250–450 mm tall. Leaf blades 50–150 mm long; 2–4 mm wide. Spikelets 10–17 mm long. Leaves flat; panicle 60–120 mm long, ovate, contracted, lower branches sometimes spreading; upper glume longer than 1/2 the spikelet; rachilla internodes 2.5–3.0 mm long, bearded; lemmas coarsely granular, scabrid below the insertion of the awn.



Sandy flats in Renosterbosveld. Rare. Locally common. Biome: Nama-Karoo. Endemic. Recorded only from the Sutherland district.

Description: Schweickerdt 1937 (189), Stapf 1898–1900 (473), Chippindall 1955 (78). Illustration: Chippindall 1955 (fig. 48(4)). Voucher: Acocks 17178. PRECIS code 9901970–00900.

***Helictotrichon natalense* (Stapf) Schweick.**

Perennial; tufted; 400–800 (–1000) mm tall. Leaf blades 100–250 mm long; 3–5 mm wide. Spikelets 7–9 mm long. Leaf blades flat; panicle to 250 mm long, usually open, with branches spreading; upper glume 2/3 the spikelet length; rachilla internodes about 1.5 mm long, hairy;



lemmas glabrous, usually smooth, nerves usually raised, column of awn a loose spiral.

Flowering November to January. On rocky hillsides and in wet places such as streamsides. Infrequent to locally common. Biome: Savanna and Grassland. Endemic. Related to *H. longifolium*, which has setaceous leaves and longer spikelets, and to *H. turgidulum* and *H. dodii*, which have longer spikelets.

Description: Schweickerdt 1937 (194), Stapf 1898–1900 (477), Chippindall 1955 (79). Illustration: Chippindall 1955 (fig. 48(1)). Voucher: De Wet 1722. PRECIS code 9901970–01000.

***Helictotrichon quinquesetum* (Steud.) Schweick.**

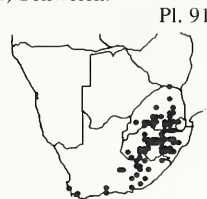
Perennial; tufted; 500–750 mm tall. Leaf blades to 250 mm long; to 4 mm wide. Spikelets 12–18 mm long. Leaves expanded or folded; panicle 120–180 mm long, contracted, almost spike-like; rachilla internodes 3.5–4.5 mm long, with hairs to 4 mm long; lemma with prominently raised nerves, finely granular.

Slopes of Table Mountain. Extremely rare. Biome: Fynbos. Endemic. Represented in most herbaria only by duplicates of the type specimen, Ecklon 929. None at PRE.

Description: Schweickerdt 1937 (188), Stapf 1898–1900 (474), Chippindall 1955 (77). Illustration: Chippindall 1955 (fig. 48(9)). PRECIS code 9901970–01100.

***Helictotrichon turgidulum* (Stapf) Schweick.**

Perennial; tufted; 300–1000 mm tall. Leaf blades 60–150(–250) mm long; 1.5–6.0 mm wide. Spikelets 10–12 mm long. Leaf blades flat; panicle 70–300 mm long, open or contracted, often interrupted; glumes broadly lanceolate, upper glume 2/3 the spikelet length; rachilla internodes 2 mm long, with hairs to 2 mm long; lemma glabrous, smooth or papillate, very often variegated with purple, lobes, above the insertion of the awn, 3–5 mm long.



Pl. 91.

Flowering October to April. Usually in wet places on mountain slopes and in vleis, occasionally at roadsides. Common. Biome: Fynbos, Savanna, and Grassland. Endemic. Vegetatively a very variable species and by far the most widespread of all the South African *Helictotrichon* species. Related to *H. dodii*, which has longer lemma lobes and broader glumes, to *H. longifolium*, which has setaceous leaves, and to *H. natalense*, which has smaller spikelets.

Description: Schweickerdt 1937 (196), Stapf 1898–1900 (474), Chippindall 1955 (79). Illustration: Chippindall 1955 (fig. 48(7) & 50). Voucher: Smook 2560. PRECIS code 9901970–01200.

***Helictotrichon* sp. (=Ellis 4663)**

Perennial; densely tufted; 300–600 mm tall. Leaf blades 100–200 mm long; setaceous, to 1.5 mm wide. Spikelets 13–18 mm long. Panicle open, branches spreading, bare for most of their length; spikelets fewer than 20; upper glume about 2/3 the spikelet length; rachilla internodes 2.8–3.3 mm long, densely hairy; lemmas glabrous.



Flowering October. In shallow humic soils between limestone outcrops. Rare. Biome: Fynbos. This species was collected by Ellis on two occasions at De Hoop. It has setaceous leaves, an open, lax panicle with very few spikelets and long rachilla internodes. This combination of characters are not matched in any other southern African *Helictotrichon* species.

Voucher: Ellis 4663. PRECIS code 9901970–99999.

Hemarthria R.Br.

Lodicularia P. Beauv.

Perennial; long-stoloniferous, or caespitose, or decumbent. Culms 300–1500 mm high; herbaceous; branched above. Leaf blades linear, or linear-lanceolate (usually); flat. *Ligule a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets overtly heteromorphic (the sunken, 'sessile' spikelets with dissimilar glumes, the non-sunken 'pedicellate' spikelets with similar glumes).*

Inflorescence of spike-like main branches, or paniculate (of 'spikes' arising one or more from the sheaths of each of the upper leaves); spatheate (usually); a complex of 'partial inflorescences' and intervening foliar organs.



Fig. 104. *Hemarthria altissima*

Spikelet-bearing axes spike-like (often curved); solitary, or clustered (fascicled); with substantial rachides; tardily disarticulating (the rachis initially tough); ultimately disarticulating at the joints. 'Articles' with a basal callus-knob (rarely), or without a basal callus-knob (usually).

Spikelets in pairs (each pair comprising a sessile spikelet and the 'pedicellate' member of the 'pair' below); consistently in 'long-and-short' combinations (the fused pedicels discernible). Pedicels of the 'pedicellate' spikelets discernible, but fused with the rachis. The sessile spikelets hermaphrodite. The 'pedicellate' spikelets hermaphrodite. Female-fertile spikelets 3–7 mm long; compressed dorsiventrally; falling with the glumes. Glumes present; two; more or less equal; awnless (but G2 sometimes long-acuminate); very dissimilar (in the embedded spikelet, the outer tough, the inner membranous), or similar (both tough in the 'pedicellate' spikelets). *Proximal incomplete florets 1*; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire; awnless. Palea present; conspicu-

ous but relatively short. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 9$, or 10. Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. 12 species. Tropical Africa, Madagascar, eastern Asia, Indomalayan region, Australia. Hydrophytic to helophytic; in open habitats (in water or in wet places); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Hemarthria altissima (Poir.) Stapf & C.E. Hubb.

Fig. 104. Pl. 92.

Batavian quick grass, red swamp grass, perdegas, rooi-kweek.



Perennial; rhizomatous and stoloniferous; 300–1500 mm tall. Leaf blades 50–150 mm long; to 6 mm wide. Spikelets (sessile and pedicellate) 5–7 mm long. Plants rust-red; racemes very narrowly cylindrical, culm-like, spikelets sunken.

Flowering October to June. Wet places. Sometimes locally dominant (in vleis and river margins). Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. Southern tropical Africa and Madagascar, Mediterranean region, southeast Asia, introduced to America. Pasture and weed (ruderal).

Description: Chippindall 1955 (519), Clayton et al. 1970–1982 (851). Illustration: Chippindall 1955 (fig. 414). Voucher: De Winter 4221. PRECIS code 9900210–00100.

Heteropogon Pers.

Spirotheros Raf.

Annual, or perennial; caespitose. Culms 200–1000 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat. *Ligule a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (heterogamous in upper parts of inflorescence only); overtly heteromorphic; in both homogamous and heterogamous combinations (lower pairs homogamous and homomorphic, male or sterile).*

Inflorescence a single raceme, or paniculate (of single 'racemes', sometimes in false panicles); spatheate, or espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (of several to many joints); solitary; disarticulating at the joints (between the heterogamous upper spikelet pairs).

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile (but the pedicel reduced to a short stump, the spikelet being supported on a long, slender callus). Pedicels free of the rachis. The sessile spikelets hermaphrodite (in upper regions of spike-like panicles only), or female-only. The pedicellate spikelets male-only, or sterile; awnless, dorsally flattened, rather asymmetric. G1 herbaceous, many nerved, winged above. Female-fertile spikelets not noticeably compressed (rarely), or compressed dorsiventrally; falling with the glumes. Glumes two; more or less equal; awnless; very dissimilar (the upper with deep longitudinal grooves). *Proximal incomplete florets 1*; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline, but stipitate-cartilaginous beneath the awn); entire; awned. Awns 1; median; apical; geniculate; much longer than the body of the lemma. Palea present, or

absent; when present very reduced. Lodicules when present 2; fleshy; glabrous. Stamens 0–3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$ and 11. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 7 species. Tropical.

Mesophytic to xerophytic; in open habitats (dry places, often on poor soils); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 2 indigenous species.

References. 1. Chippindall 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell & M. Koekemoer.

1(0). Perennial; leaf blades usually folded, 3–8 mm wide; glands absent; pedicelled spikelets 8–13 mm long

..... **H. contortus**

Annual; leaf blades flat, to 12 mm wide; dark crateriform glands present on spathes, peduncles and lower glumes of pedicelled spikelets; pedicelled spikelets 16–20 mm long

..... **H. melanocarpus**

Heteropogon contortus (L.) Roem. & Schult.

Fig. 105. Pl. 93.

Tanglehead, pylgras, assegaai-gras.

Perennial; rhizomatous; 200–1000 mm tall. Leaf blades 30–300 mm long; 3–8 mm wide. Spikelets (sessile) 5.5–7 mm long (pedicellate 8–13 mm long and glandless). Leaves usually folded, the tips rounded and often hooded; inflorescence a single spike with velvety awns from the upper half.

Flowering October to June. Hillsides and rocky places on well-drained soils. Common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Tropical and warm regions. The large, awned, single-raceme inflorescence resembles *Urelytrum agropyroides* and *Trachypogon spicatus*, but in both these species the inflorescence has awns throughout its length. *H. contortus* often occurs with *Themeda triandra* and *Schizachyrium sanguineum* and may resemble them vegetatively. However, *Themeda* has tapering leaf tips and the ligule is usually notched and *S. sanguineum* has a strongly curved ligule and the plant is red or purple tinged.

Description: Chippindall 1955 (492), Clayton et al. 1970–1982 (827). Illustration: Chippindall 1955 (fig. 400), Clayton et al. 1970–1982 (fig. 191), Hitchcock & Chase 1950 (fig. 1182). Voucher: Giess, Volk & Bleissner 6429. PRECIS code 9900800–00100.

Heteropogon melanocarpus (Ell.) Benth.

Sweet tanglehead, eenjarige assegaigras.

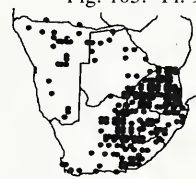
Robust annual; tufted; 500–2000 mm tall. Leaf blades to 500 mm long; to 12 mm wide. Spikelets (sessile) 10–11 mm long (pedicellate with lower glume 16–20 mm long, with a row of depressed glands in the middle). With stilt roots; leaf blades flat.

Flowering January to May. Roadsides and rocky places, often on turf soil. Conservation status not known. Locally common. Biome: Savanna. Tropical Africa to India, tropical America.

Description: Chippindall 1955 (494), Clayton et al. 1970–1982 (827). Illustration: Hitchcock & Chase 1950 (fig. 1183). Voucher: De Winter & Marais 4601. PRECIS code 9900800–00200.



Fig. 105. *Heteropogon contortus*



Holcus L.

Arthrochloa R. Br., *Ginannia* Bub., *Homalachna* Kuntze, *Nothoholcus* Nash, *Notholcus* Hitchc., *Sorghum* Adans.

Annual (rarely), or perennial; long-rhizomatous to long-stoloniferous, or caespitose. Culms 80–1500 mm high; herbaceous; unbranched above. *Leaf blades* linear to linear-lanceolate; flat; *without readily visible transverse veins. Ligule an unfringed membrane to a fringed membrane.*

Inflorescence paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 3–8 mm long; compressed laterally; *falling with the glumes.* Glumes two; more or less equal; about equalling the spikelets; awned (rarely), or awnless; similar (membranous). *Upper glume* 3 nerved. Incomplete florets distal to the female-fertile florets (spikelets 2-flowered, the lower hermaphrodite, the upper usually male-only), clearly specialised and modified in form; awned (with a short dorsal awn); *proximal incomplete florets absent.*



Fig. 106. *Holcus lanatus*

Female-fertile florets 1(–2). *Lemmas* decidedly firmer than the glumes (leathery); 3–5 nerved; entire, or incised; awnless, or awned. *Awns* when present 1; dorsal; geniculate. *Palea* present; relatively long. *Lodicules* 2; membranous; glabrous. *Stamens* 3. *Ovary* glabrous. *Fruit* small; hilum short, or long-linear (rarely); embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 4$ and 7. Pooideae; Poodae; Aveneae. 6 species. 8 Canary Is., North Africa, Europe to Asia Minor & Caucasus; 1 South Africa. Mesophytic; in shade and in open habitats (grassland, open woodland, disturbed ground); glycophytic. Transvaal, Natal, and Cape Province. Indigenous species (1), naturalized species (1).

References. 1. Tutin. 1980. FL. Europ. 5: 230.

Species treatment by T.M. Sokutu.

- 1(0). Perennial; leaves villous; upper glume awn to 1 mm long; upper floret usually male **H. lanatus**
Annual; leaves puberulous; upper glume with an awn 2–6 mm long; upper floret sterile **H. setiger**

Holcus lanatus L.

Velvet grass, Yorkshire fog, soft grass.

Fig. 106. Pl. 94.



Perennial; loosely tufted; 300–1000 mm tall. *Leaf blades* 1.5–8.0 mm wide. *Spikelets* 3–4 mm long. Leaves conspicuously woolly, greyish to blue-green; lower glume awn never exceeding 0.5 mm; upper glume awn to 1 mm long; upper floret male.

Flowering November to January. Vleis, damp sheltered places, on sandy to nutrient rich soils. Common (in its habitats). Naturalized from Europe. Biome: Fynbos, Savanna, and Forest. Europe and the Mediterranean. Occasionally cultivated pasture and weed. A distinct species which cannot be confused because of its relatively short-awned glumes, although variable in the glume and lemma awn length. In the past the name *H. mollis* was missapplied to some specimens of this taxon.

Description: Hubbard 1954 Grasses (237), Tutin 1980 (5: 230). Stapf 1898–1900 (465), Chippindall 1955 (87). Illustration: Chippindall 1955 (fig. 58). Voucher: Smook 4878, Dyer 6277. PRECIS code 9901920-00100.

Holcus setiger Nees

Annual; culms solitary or loosely tufted; 150–300 mm tall. *Leaf blades* 25–140 mm long; 1.0–4.5 mm wide. *Spikelets* 3–4 mm long. Leaves puberulous, rarely hairy, pale to dark green; lower glume awn to 1 mm long; upper glume awn 2–6 mm long; upper floret sterile.



Flowering November to January. On damp and/or sheltered places, sandy to sandy loam soils. Locally common. Biome: Fynbos and Succulent Karoo. Endemic. Chippindall (1955) comments that the forms from George and Namaqualand are exceptionally slender and weak. However, this character is not sufficient to distinguish these forms, as it falls within the variability of the species. In the past the name *H. mollis* has been missapplied to some specimens of this taxon.

Description: Adams. & Salter 1950 (66), Stapf 1898–1900 (464), Chippindall 1955 (87). Voucher: Acocks 22966, Taylor 3489. PRECIS code 9901920-00300.

Hordeum L.

Critesion Raf., *Critho* Meyer, *Zeocrithon* P. Beauv., *Zeocrithon* Wolf.

Annual, or perennial; caespitose (or solitary culms). Culms 50–1300 mm high; herbaceous; unbranched above. *Leaf blades* linear; usually flat, or folded (convolute). *Ligule an unfringed membrane.* The spikelets of sexually distinct forms on the same plant (the lateral spikelets sterile in *Critesion*, male in *Hordeum* s. str.).

*Inflorescence a false spike, with clusters of spikelets on reduced axes; contracted; espatheate. Spikelet-bearing axes disarticulating (e.g., *Critesion*), or persistent (*Hordeum* s. str.); when disarticulating, *disarticulating at the joints*.*

Female-fertile spikelets in triplets (the triplets shed together); distichous, or not two-ranked (2–6 rows); consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations (rarely, the laterals also sessile). Female-fertile spikelets compressed laterally to not noticeably compressed; falling with the glumes (the triplets falling together), or not disarticulating (in cultivated forms). Glumes two; more or less equal; awned; similar (persistent, narrow, awn- or bristle-like above). Spikelets with female-fertile florets only; *proximal incomplete florets absent*. Male or sterile spikelets, when present, awnless.

Female-fertile florets 1. Lemmas similar in texture to the glumes (coriaceous); 5 nerved; entire, or incised (sometimes trifid); nearly always awned. Awns 1; median; apical; non-geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; relatively long. Lodicules membranous; ciliate. Stamens 3. Ovary hairy. Fruit small, or medium sized, or large; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Triticoideae; Triticeae. About 40 species. North temperate & South America. Mesophytic, or xerophytic; in open habitats (open weedy places, mostly on dry soils); maritime-arenicolous, halophytic, and glycophytic. Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. Indigenous species (1), naturalized species (3).

Intergeneric hybrids with *Elytrigia* (*X Elytrohordeum* Hylander), *Agropyron* (*X Agrohordeum* A. Camus), *Secale*

(*X Horde* Ciferri & Giacom.), *Sitanion* (*X Sitordeum* Bowden), *Triticum* (*X Tritordeum* Aschers. & Graebn.). See also *X Elyhordeum* Zizan & Petrowa.

References. 1. Chippindall. 1955. Gr. & Past. 2. Bothmer et al. 1980. Bot. Notiser 133: 539. 3. Humphries. 1980. Fl. Europ. 4. Dewey. 1984. Genomic classification in Gustafson, Gene manipulation: 209.

Species treatment by M. Koekemoer.

- 1(0). Spikes narrower than 6 mm; spikelets with awns shorter than 10 mm ***H. stenostachys***
Spikes wider than 6 mm; spikelets with awns longer than 10 mm 2
- 2(1). Plants perennial; leaf sheaths lacking auricles, sheaths fibrous with age; upper leaf blades usually rigid ***H. capense***
Plants annual; leaf sheaths auricled, not fibrous with age, upper leaf blades soft or firm 3
- 3(2). Glumes of lateral spikelets scabrid or smooth ***H. marinum* subsp. *gussoneanum***
Glumes of lateral spikelets long-ciliate 4
- 4(3). Anthers of central spikelet 0.2–0.5 mm long; prolongation of rachilla of lateral spikelets stout, orange-brown ... ***H. murinum* subsp. *glaucum***
Anthers of central spikelet 0.7–1.4 mm long; prolongation of rachilla of lateral spikelets slender, green 5
- 5(4). Central spikelet sessile or with a pedicel not more than 0.6 mm long; lateral spikelets as long as or shorter than the central spikelet ***H. murinum* subsp. *murinum***
Central spikelet with pedicel (0.7–)0.9–1.8 mm long; lateral spikelets longer than the central spikelet ***H. murinum* subsp. *leporinum***

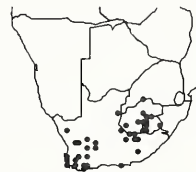
Hordeum capense Thunb.

(=*H. nodosum* auctt., non L.) 1.

Perennial; tufted; 200–600 mm tall. Leaf blades 60–170 (–240) mm long; 3–6 mm wide. Leaf sheaths fibrous with age; blades rigid, lacking auricles; spike 8–17 mm wide (including awns), rachis readily disarticulating at maturity; spikelet awns to 20 mm long.

Flowering October to April. Usually in moist areas such as streamsides, riverbanks and around dams, occasionally in disturbed areas. Infrequent to locally common. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. Endemic. Potential pasture. Similar to *H. marinum* and *H. murinum*, which are annual and have leaf sheaths auricled.

Description: Chippindall 1955 (72). Voucher: Loxton 239. PRECIS code 9904510–00100.



Hordeum marinum Huds. subsp. *gussoneanum* (Parl.) Thell.

(=*Critesion marinum* (Huds.) Loeve) 4.

Mediterranean barley.

Annual; culms solitary or loosely tufted (often geniculate); 150–400 mm tall. Leaf blades 20–80 mm long; 2–4 mm wide.



Fig. 107. *Hordeum murinum*

Leaf sheaths auricled, not fibrous with age; blades soft; spike 15–25 mm wide, fragile, rachis disarticulating readily at maturity; spikelet awns to 30 mm long.

Flowering September to November. Usually on roadsides or in moist waste and disturbed places. Locally common. Naturalized from Europe. Biome: Fynbos and Succulent Karoo. Europe, Mediterranean basin and in the U.S.A. Closely related to *H. murinum*, which has the glumes of the lateral spikelets long ciliate.

Description: Bor 1985 (1833), Hitchcock & Chase 1950 (266). Voucher: Vlok 1575. PRECIS code 9904510–00250.

***Hordeum murinum* L. subsp. *glaucum* (Steud.) Tzvel.**

Differs from subsp. *murinum* in that the anthers of the central spikelet are 0.2–0.5 mm long and the prolongation of the rachilla of the lateral spikelets stout and orange-brown.

Flowering August to October. On sandy soils, usually in disturbed areas. Locally common. Naturalized from Europe. Biome: Fynbos, Savanna, and Succulent Karoo. Mediterranean Basin of Europe. Weed.

Description: Humphries 1980 (5:204). Voucher: Oliver 151. PRECIS code 9904510–00325.



***Hordeum murinum* L. subsp. *leporinum* (Link) Archangeli**

Differs from subsp. *murinum* in that the central spikelet has a pedicel (0.7–)0.9–1.8 mm long and lateral spikelets longer than the central one.

Flowering September to November. Disturbed areas. Infrequent to locally common. Naturalized from Europe. Biome: Fynbos and Grassland. Europe. Weed.

Description: Humphries 1980 (5:204). Voucher: Van Breda 2011. PRECIS code 9904510–00330.



Hordeum murinum* L. subsp. *murinum

(=*Critesion murinum* (L.) Loeve) 4.

False barley, muiswildegars.

Annual; culms solitary or loosely tufted; 50–500 mm tall. Leaf blades 20–150(–250) mm long; 2–8 mm wide. Leaf sheaths auricled, not fibrous with age; blades soft; spike 15–25 mm wide, rachis disarticulating readily at maturity, the central spikelet sessile or with a pedicel shorter than 0.6 mm; lateral spikelets shorter or as long as central spikelet; awns to 30 mm long; anthers of central spikelet 0.7–1.4 mm long; prolongation of rachilla of lateral spikelets slender and green.

Flowering October to December. On sandy soil, usually in disturbed areas. Locally common. Naturalized from Europe. Biome: Fynbos, Savanna, and Succulent Karoo. Introduced and naturalized in many countries. Weed (in sandy waste places). The long-ciliate glumes of the lateral spikelets distinguish this taxon from *H. murinum* subsp. *gussoncanum*.

Description: Humphries 1980 (5:204), Hitchcock & Chase 1950 (268), Chippindall 1955 (72). Illustration: Chippindall 1955 (fig. 44). Voucher: Orchard 511. PRECIS code 9904510–00335.

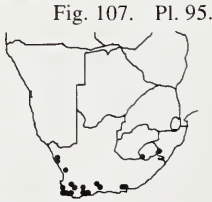


Fig. 107. Pl. 95.

***Hordeum stenostachys* Godr.**

(=*Critesion stenostachys* (Godr.) Loeve) 4; (=*H. compressum* Griseb.) 2.



Perennial; tufted; (280–)350–1200(–1500) mm tall. Leaf blades 25–90(–102) mm long; 1.5–5.0(–7.0) mm wide. Leaf sheaths lacking auricles; spike 3–5 mm wide (including awns), often partly enclosed in uppermost leaf sheath; rachis readily disarticulating at maturity; spikelet awns 2.5–8.0 mm long.

Flowering October to March. In moist or seasonally moist areas, vleis and also in disturbed places. Locally common. Probably naturalized from south America. Biome: Grassland and Nama-Karoo. Tropical South America. Pasture (eaten by stock). Easily distinguished from the other *Hordeum* species in southern Africa by the narrow, slender spikes and short awns.

Description: Von Bothmer, Jacobsen & Nicora 1980 Bot. Notiser 133 (546). Voucher: Comins 845. PRECIS code 9904510–00385.

***Hyparrhenia* Fourn.**

Annual (rarely), or perennial (usually large); caespitose. Culms 300–3000(–4000) mm high; herbaceous. Leaf blades linear; usually flat, or folded (sometimes). *Ligule an unfripped membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (the lower spikelet pairs homogamous, the upper pairs heterogamous); overtly heteromorphic (imperfect spikelets sometimes with awned glumes, the L2 awnless).*

Inflorescence paniculate (leafy); with capillary branchlets (i.e., the articles of the racemes, and the peduncles); spatheate; a complex of 'partial inflorescences' and intervening foliar organs. Spikelet-bearing axes 'racemes'; paired (with a common peduncle, the upper raceme base usually much shorter than 9 mm — by contrast with Exothea); with very slender rachides; disarticulating at the joints.

Spikelets in pairs (with terminal triplets); consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite (in the upper pairs only). The pedicellate spikelets male-only, or sterile; usually longer than the sessile, G1 often mucronate or aristate. L2 awnless, sometimes suppressed. Female-fertile spikelets 3.5–10 mm long; not noticeably compressed to compressed dorsiventrally; falling with the glumes. Glumes two; more or less equal; awnless; very dissimilar (lower rounded or dorsally flattened; upper narrower, shallowly naviculate). *Lower glume not two-keeled (striate or grooved). Proximal incomplete florets 1; epaleate; sterile.*

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline, but hardening and stipitate to the awn); incised; awned. Awns 1; median; from the sinus (flanked by tiny teeth); geniculate; much longer than the body of the lemma. Palea present, or absent; when present relatively long, or conspicuous but relatively short, or very reduced. Lodicules 2; fleshy, or membranous; glabrous. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$ and 15. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. About 55 species. Mediterranean, Africa, Arabia, America. Mesophytic, or

xerophytic; in open habitats (savanna); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 20 indigenous species.

References. 1. Clayton. 1969. Kew Bull. Add. Ser. II. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell & M. Koekemoer.



Fig. 108. *Hyparrhenia hirta*

- 1(0). Upper raceme base with a scarious appendage 3–4 mm long at apex, just below spikelets 2
 Upper raceme base lacking an appendage (but sometimes with a scarious rim or short tooth to 0.5 mm long) 3
 2(1). Lower glume of sessile spikelet glabrous or with a few hairs at tip *H. newtonii* var. *newtonii*
 Lower glume of sessile spikelet with long hairs ... *H. newtonii* var. *macra*

- 3(1). Raceme bases terete, markedly unequal, the upper at least 3 times longer than the lower, usually not deflexed (but often deflexed in *H. quarrei*) 4
 Raceme bases flattened, subequal, often deflexed at maturity, usually less than 2 mm long 14
 4(3). Spikelets with reddish brown or yellowish hairs ... 5
 Spikelets with white hairs, or glabrous 8
 5(4). Sessile spikelets 5–7 mm long, callus 0.8–2.0 mm long 6
 Sessile spikelets 3–5 mm long, callus 0.2–0.8 mm long 7
 6(5). Basal leaf sheaths with spreading white hairs; upper raceme base 2–3 mm long *H. nyassae*
 Basal leaf sheaths glabrous or rarely with a few hairs; upper raceme base 3.5–7.0 mm long *H. poecilotracha*
 7(5). Panicle lax or contracted; spatheoles linear, 40–50 mm long; awns 9–14 per raceme pair ... *H. rufa*
 Panicle copiously branched; spatheoles narrowly lanceolate, 20–40 mm long; awns 6–10 per raceme pair *H. dichroa*
 8(4). Upper raceme with 0 or 1 pairs of homogamous spikelets at base 9
 Upper raceme with 2 pairs of homogamous spikelets at base 12
 9(8). Spikelets glabrous or hispidulous 10
 Spikelets pubescent to villous 11
 10(9). Culms slender; callus cuneate, 0.8–1.5 mm long; upper raceme base (2–)2.5–3.5 mm long; awns 4–5 per raceme pair *H. gazensis*
 Culms robust; callus linear, slender, 1–2 mm long; upper raceme base 1.5–2.5 mm long; awns 2–6 per raceme pair *H. finitima*
 11(9). Racemes never deflexed; awns 8–14 per raceme pair *H. hirta*
 Racemes, or some of them, deflexed; awns 6–10 per raceme pair *H. quarrei*
 12(8). Awns 4–7 per raceme pair, 25–40 mm long, with hairs 0.1–0.6 mm long; racemes 15–25 mm long; callus 1.0–1.8 mm long; pedicellate spikelets awnless or with an awn-point to 2 mm long ... *H. anamesa*
 Awns 2–4 per raceme pair, 30–55 mm long, with hairs 0.7–1.2 mm long; racemes 10–12 mm long; callus 1.8–3.0 mm long; pedicellate spikelets with an awn 1–5 mm long 13
 13(12). Spikelets glabrous; awns 2(–4) per raceme pair *H. filipendula* var. *filipendula*
 Spikelets white-villous; awns (2–)4 per raceme pair *H. filipendula* var. *pilosa*
 14(3). Awns 10–15 per raceme pair *H. dregeana*
 Awns fewer than 9 per raceme pair 15
 15(14). Pedicellate spikelets glabrous or nearly so between nerves and margins (or shortly pilose in *H. schimperi*) 16
 Pedicellate spikelets villous 19
 16(15). Awns 3–5 per raceme pair; peduncles 9 mm long or less 17
 Awns (4–)6–8 per raceme pair; peduncles more than 9 mm long 18
 17(16). Awns to 16(–20) mm long; spatheoles 8–18 mm long; callus square *H. cymbaria*
 Awns 18–30 mm long; spatheoles 14–24 mm long; callus cuneate *H. variabilis*
 18(16). Awns 7–17 mm long; plants slender and rambling; callus oblong or square; pedicellate spikelets glabrous *H. pilgeriana*
 Awns 20–35 mm long; plants robust, erect; callus cuneate to acute; pedicellate spikelets glabrous or sparsely pilose *H. schimperi*
 19(15). Basal sheaths hairy; plants densely tufted *H. tamba*
 Basal sheaths without hairs; plants more loosely tufted 20

- 20(19). Awns 7–13 mm long; spatheoles 12–23 mm long; peduncles 3–13 mm long; callus rounded; culms robust, with stilt roots **H. umbrosa**
Awns more than 15 mm long; spatheoles 20–40 mm long; peduncles 10–30 mm long; callus cuneate; culms robust or slender, with or without stilt roots 21
- 21(20). Awns 22–40 mm long; pedicellate spikelets usually with an awn 2–6 mm long; culms very robust, exposed at the base, with well-developed stilt roots, lowest internodes narrower than those above **H. rudis**
Awns 15–25 mm long; pedicellate spikelets with a short awn-point 1–3 mm long; culms robust or slender, clad in old leaf sheaths at base, without well-developed stilt roots, lowest internode similar in width to upper ones 22
- 22(21). Culms robust, sometimes with small stilt roots; plants 1000–2000(–3000) m tall . . . **H. tamba**
Culms slender, without stilt roots, arising in clumps from a short rhizome; plants 300–1300 mm tall **H. collina**

Hyparrhenia anamesa Clayton

Perennial; rhizomatous and tufted (densely); 600–1200 mm tall. Leaf blades to 400 mm long (but often shorter); 4 mm wide. Spikelets (sessile) 5.0–6.5 mm long (white-villous, callus 1.0–1.8 mm long). Racemes 15–25 mm long, with 2 homogamous pairs at base of upper raceme, raceme pairs with 4–7 awns 25–40 mm long having hairs to 0.6 mm long; raceme bases terete, unequal; pedicellate spikelets awnless or with an awn-point to 2 mm long.

Flowering October to May. Dry soils, open places. Common. Biome: Fynbos, Savanna, and Grassland. Eastern Africa. This recently-described species is intermediate between *H. hirta*, which has longer racemes, more awns and 0 or 1 homogamous pairs at the upper raceme base, and *H. filipendula*, which has shorter racemes with fewer awns. Some specimens formerly assigned to *H. hirta* are now segregated in this species, but its validity in the field is not yet assessed.

Description: Clayton et al. 1970–1982 (800), Clayton 1969 (85). Illustration: Clayton 1969, (fig. 21) Clayton et al. 1970–1982 (fig. 184). Voucher: Rodin 3821. PRECIS code 9900730–00100.

Hyparrhenia collina (Pilg.) Stapf

Elephant grass, olifantsgras.

Slender perennial; rhizomatous and tufted (loosely); 300–1300 mm tall. Leaf blades to 300 mm long; 2–5 mm wide. Spikelets (sessile) 4.5–5.0 mm long (usually dark purple with white hairs, callus cuneate). Spatheoles 20–40 mm long; peduncles 10–25 mm long; raceme pairs with 4–6 awns 15–25 mm long; raceme bases subequal, flattened; pedicellate spikelets villous.

Flowering April to May. Damp soils and dry savanna. Infrequent. Eastern Africa to Sudan. Imperfectly separated from the closely related *H. rudis*, *H. dregeana* and *H. tamba*, but it may be distinguished by its slender culms.

Description: Clayton et al. 1970–1982 (811), Clayton 1969 (130). Voucher: Du Toit 2412. PRECIS code 9900730–00200.

Hyparrhenia cymbaria (L.) Stapf

Boat thatching grass, bootjietamboekiegras.



Robust perennial; rhizomatous and tufted (coarsely); 2000–4000 mm tall. Leaf blades to 450 mm long; 6–20 mm wide. Spikelets (sessile) 3.8–4.5 mm long (glabrescent to shortly pubescent, often purplish, callus square, 0.2–0.3 mm long). With stilt roots; spatheoles ovate, bright reddish-brown, 8–18 mm long; peduncles 3–8 mm long; raceme pairs with 3–5(–6) awns to 16 mm long; raceme bases subequal, flattened; pedicellate spikelets glabrous to puberulous, margins ciliate.

Flowering November to June. Forest margins, open hillsides. Common. Biome: Savanna and Grassland. Tropical Africa, Madagascar and Comoro Islands. Closely related to *H. umbrosa* and grades into *H. variabilis*, but distinguished by its small ovate spatheoles and short square callus.

Description: Clayton et al. 1970–1982 (804), Clayton 1969 (110). Illustration: Chippindall 1955 (pl. 16.II). Voucher: Scheepers 190. PRECIS code 9900730–00300.

Hyparrhenia dichroa (Steud.) Stapf

Perennial (culms stout); rhizomatous and tufted; to 3000 mm tall. Leaf blades to 600 mm long; to 8 mm wide. Spikelets (sessile) 4–5 mm long (hairs pale brownish, scanty, callus 0.4–0.8 mm long). Panicle copiously branched; spatheoles narrowly lanceolate, 20–40 mm long; raceme pairs with 6–10 awns (10–)20–30 mm long, racemes often clasped at the base by spatheoles at maturity; raceme bases terete, unequal.

Flowering March to June. Moist places, weedy places, roadsides. Locally common. Biome: Savanna. To Sudan and Zaïre. Intergrades with its close relative *H. rufa*, which has exserted racemes and more awns, and similar to *H. gazensis*, which has slender culms and fewer awns, and *H. finitima*, which has a thin pungent callus.

Description: Clayton et al. 1970–1982 (796), Clayton 1969 (68). Voucher: Strey & Schlieben 8597. PRECIS code 9900730–00400.

Hyparrhenia dregeana (Nees) Stapf

(= *H. aucta* (Stapf) Stapf ex Stent) 1; (= *H. pilosissima* (Hack.) J.G. Anders.) 1.

Harige bloutamboekiegras, hairy blue thatching grass.



Robust perennial; rhizomatous and tufted (densely); 1500–2000 mm tall. Leaf blades to 600 mm long; 3–8 mm wide. Spikelets (sessile) 4–5 mm long (densely long-hairy to shortly hairy, rarely glabrous, callus cuneate, 1 mm long). Culms 4–9 mm across; basal sheaths hairy; spatheoles 20–25 mm long; peduncles 15–50 mm long; raceme pairs with 10–25 awns 8–20 mm long; raceme bases subequal, flattened, short-appendaged; pedicellate spikelets villous to hispidulous, rarely glabrous.

Flowering November to May. Stony hillsides, streamsides, dry soils around vleis. Common. Biome: Savanna and Grassland. Eastern Africa. Related to *H. collina*, *H. tamba*, and *H. rudis*, from which it may be distinguished by its densely tufted habit and very many short awns.

Description: Clayton et al. 1970–1982 (809), Clayton 1969 (124). Voucher: Liebenberg 6820. PRECIS code 9900730–00500.

Hyparrhenia filipendula* (Hochst.) Stapf var. *filipendula

Fine thatching grass, fyntamboekiegras.

Delicate and graceful perennial; rhizomatous and tufted; 600–2000 mm tall. Leaf blades to 300 mm long; to 4 mm wide. Spikelets (sessile) 5.5–7 mm long (glabrous, callus 1.8–3.0 mm long). Racemes 10–12 mm long; raceme pairs with 2(–4) awns 30–55 mm long, with hairs to 1.2 mm long; raceme bases terete, unequal, with 2 pairs of homogamous spikelets at base of upper raceme; pedicellate spikelets with an awn 1–5 mm long.

Flowering November to April. Woodlands, higher rainfall areas, open veld. Common. Biome: Savanna. Tropical Africa, Madagascar, Ceylon to Australia. Domestic use (thatching). Intergrades with var. *pilosa*, which in turn intergrades with *H. hirta* and *H. anamesa*, but recognized by its graceful appearance, with many slender branches, drooping peduncles and small, few-awned racemes.

Description: Clayton et al. 1970–1982 (803), Clayton 1969 (95). Illustration: Chippindall 1955 (fig. 408B). Voucher: Codd 6880. PRECIS code 9900730–00600.

***Hyparrhenia filipendula* (Hochst.) Stapf var. *pilosa* (Hochst.) Stapf**

Fyntamboekiegras, fine thatching grass.

Perennial; rhizomatous and tufted; 600–2000 mm tall. Leaf blades to 300 mm long; to 4 mm wide. Spikelets (sessile) 5.5–7.0 mm long (white-villous, callus 1.8–3.0 mm long). Racemes 10–12 mm long; raceme pairs with (2–)4 awns 30–55 mm long, with hairs to 1.2 mm long; raceme bases terete, unequal, with 2 pairs of homogamous spikelets at base of upper raceme; pedicellate spikelets with an awn 1–5 mm long.

Flowering December to April. Open veld and disturbed places in higher rainfall areas. Common. Biome: Savanna and Grassland. Tropical Africa, southern Asia to Australia. Domestic use (thatching). Forms a bridge between var. *filipendula* and *H. hirta* and *H. anamesa*, and most recently not treated as separate from the typical variety (Clayton & Renvoize 1982).

Description: Clayton 1969 (97). Voucher: De Winter 2863. PRECIS code 9900730–00700.

***Hyparrhenia finitima* (Hochst.) Anderss. ex Stapf**

Robust perennial; rhizomatous; 1000–2000 mm tall. Leaf blades to 600 mm long; to 8 mm wide. Spikelets (sessile) 5.5–6.0 mm long (yellowish, glabrous to shortly white hairy, callus linear, pungent, 1–2 mm long). Raceme pairs with 2–6 awns 25–40 mm long; raceme bases terete, unequal, upper raceme base 1.5–2.5 mm long, homogamous spikelets 0–1 pair at base of upper racemes.

Flowering December to March. Rocky places, disturbed places. Infrequent. Biome: Savanna. Tropical Africa. Closely related to *H. gazensis*, but distinguished by its robust culms and thin callus.

Description: Clayton et al. 1970–82 (797), Clayton 1969 (72). Voucher: Van Vuuren 1685. PRECIS code 9900730–00800.

***Hyparrhenia gazensis* (Rendle) Stapf**

Polgras.

Perennial; rhizomatous and tufted (loosely); 500–1800 mm tall. Leaf blades 80–200 mm long; 2–5 mm wide. Spikelets (sessile) 4.0–5.5 mm long (white-hispidulous, callus cuneate, 0.8–1.5 mm long). Culms slender; raceme pairs with 4–5 awns 20–30 mm long; raceme bases terete, unequal, upper raceme base (2.0–)2.5–3.5 mm long, homogamous spikelets 0–1 pair at base of upper racemes.

Flowering November to May. Ruderal on poor soils, roadsides. Locally common. Biome: Savanna. Southern tropical Africa. Related to *H. finitima* and *H. dichroa*, but distinguished by its combination of slender culms, cuneate callus and few awns.

Description: Clayton et al. 1970–1982 (797), Clayton 1969 (71). Voucher: De Winter & Codd 145. PRECIS code 9900730–00900.

***Hyparrhenia hirta* (L.) Stapf**

Common thatching grass, dek-tamboekiegras.

Perennial; rhizomatous and tufted (wiry); 300–800 mm tall. Leaf blades 20–150 mm long; 1–2(–4) mm wide. Spikelets (sessile) 4.0–6.5 mm long (yellowish green to violet, white-villous, callus acute). Culms slender; panicle scanty, of 2–10 raceme pairs, the pairs with 0–1 homogamous pairs at base of upper racemes and 8–14 awns 10–35 mm long with hairs to 0.3 mm long; raceme bases terete, unequal; racemes never deflexed, 20–40 mm long.

Flowering September to June. Stony soils. Dominant. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Throughout Africa to the Mediterranean and Pakistan. Domestic use (thatching), or indicator (climax). The most widespread of all the hyparrhenias, *H. hirta* is linked through *H. quarrei* to *H. nyassae*, through *H. anamesa* to *H. filipendula* and also to *H. dregeana* and *H. finitima*. *H. hirta* may be recognized by its hard basal tussock, harsh narrow leaves and scanty panicle of white villous racemes which do not deflex.

Description: Clayton et al. 1970–1982 (798), Clayton 1969 (75). Illustration: Chippindall 1955 (fig. 408A). Voucher: De Winter 2579. PRECIS code 9900730–01000.

***Hyparrhenia newtonii* (Hack.) Stapf var. *macra* Stapf**

Perennial; rhizomatous and tufted (densely); 600–1200 mm tall. Leaf blades to 300 mm long; to 3 mm wide. Spikelets (sessile) 6–10 mm long (lower glume hairy, callus acute to pungent, 1.5–2.0 mm long). Basal sheaths tomentose or glabrous, raceme pairs with 2–4 awns 25–55 mm long; raceme bases covered with stiff hairs, upper raceme base with a linear scarious appendage 3–4 mm long.

Flowering December to April. Stony hillsides. Infrequent. Biome: Savanna and Grassland. Southern tropical Africa. This variety is doubtfully distinct, distinguished from the typical var. *newtonii* only by the hairy lower glume of the sessile spikelet.

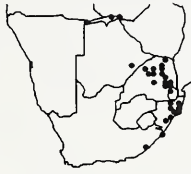


Fig. 108. Pl. 96.



Description: Clayton et al. 1970–1982 (816), Clayton 1969 (150). Voucher: Louw 2720. PRECIS code 9900730–01300.

Hyparrhenia newtonii* (Hack.) Stapf var. *newtonii

Bearded thatching grass.

Perennial; rhizomatous and tufted; 300–1000 mm tall. Leaf blades to 300 mm long; to 3 mm wide. Spikelets (sessile) 6–10 mm long (lower glume glabrous or with a few hairs at tip, callus acute to pungent, 1.5–2.0 mm long). Basal sheaths tomentose or glabrous, raceme pairs with 2–4 awns 25–55 mm long; raceme bases covered with stiff hairs, upper raceme base with a linear scarious appendage 3–4 mm long.

Flowering December to March. Stony hillsides. Infrequent. Biome: Savanna and Grassland. Western tropical Africa, Madagascar, southeast Asia, Indonesia.

Description: Clayton et al. 1970–1982 (816), Clayton 1969 (149). Illustration: Clayton et al. 1970–1982 (fig. 186). Voucher: Story 1645. PRECIS code 9900730–01350.



***Hyparrhenia nyassae* (Rendle) Stapf**

Bronsaartamboekiegras, bronze awned thatching grass.

Perennial; rhizomatous and tufted; 600–1300 mm tall. Leaf blades to 450 mm long; 2–5 mm wide. Spikelets (sessile) 5–6 mm long (yellowish-green to violet, with golden-yellow hairs, the callus linear or narrowly cuneate, 0.8–1.2 mm long). Basal sheaths with dense spreading white hairs; raceme pairs with 6–14 awns 20–40 mm long; raceme bases terete, unequal, upper raceme base 2–3 mm long.

Flowering November to March. Moist places in open veld. Locally common. Biome: Savanna and Grassland. Tropical Africa and southeast Asia. Related to *H. rufa*, which has no hairs on the basal sheaths, a shorter callus and less hairy racemes. *H. nyassae* also intergrades with *H. quarrei*, which has white raceme hairs.

Description: Clayton et al. 1970–1982 (793), Clayton 1969 (53). Voucher: De Winter & Codd 432. PRECIS code 9900730–01400.



***Hyparrhenia pilgeriana* C.E. Hubb.**

Slender perennial; rhizomatous and tufted (but lax and rambling); 300–600 mm tall. Leaf blades 50–110 mm long; 2–4 mm wide. Spikelets (sessile) 4 mm long (glabrous or with very short white hairs, callus oblong or square). Peduncles 9–30 mm long, racemes exerted from spatheoles; raceme pairs with 6–7 awns 7–17 mm long; raceme bases subequal or the upper somewhat longer (to 1.5 mm), flattened, shortly appendaged; pedicellate spikelets glabrous.

Flowering February to March. Seasonal swamps, old fallow land. Infrequent. Biome: Grassland. Eastern Africa. Resembles *H. cymbaria*, which is a robust plant with racemes enveloped by the short spatheoles, and *H. gazensis*, which has longer awns.

Description: Clayton et al. 1970–1982 (807), Clayton 1969 (115). Illustration: Clayton 1969 (fig. 27). Voucher: McClean 101. PRECIS code 9900730–01500.



***Hyparrhenia poecilotricha* (Hack.) Stapf**

(=*H. buchanani* (Stapf) Stapf ex Stent) 1.

Perennial; rhizomatous and tufted; 600–1300 mm tall. Leaf blades to 300 mm long; to 3 mm wide. Spikelets (sessile) 5.5–7.0 mm long (with yellow or reddish-brown hairs; callus acute to pungent, 1–2 mm long). Racemes pairs with 4–7 awns 25–40 mm long; raceme bases terete, unequal, upper raceme base 3.5–7.0 mm long, with 2 pairs of homogamous spikelets.

Flowering December to April. Bushveld. Locally common. Biome: Savanna and Grassland. Eastern tropical Africa. A variable species that connects *H. rufa*, *H. nyassae*, *H. filipendula* and the tropical species *H. familiaris* (Steud.) Stapf, probably through introgressive hybridization. It may be recognized by its tendency to a long upper raceme base.

Description: Clayton et al. 1970–1982 (796), Clayton 1969 (69). Voucher: Giess, Volk & Bleissner 6452. PRECIS code 9900730–01600.



***Hyparrhenia quarrei* Robyns**

Perennial; short rhizomatous and tufted; 1000–2000 mm tall. Leaf blades to 400 mm long; to 5 mm wide. Spikelets (sessile) 4.5–5.5 mm long (white pubescent to villous, callus slender, 0.7–1.2 mm long). Raceme pairs with 6–10 awns 18–36 mm long; raceme bases unequal, terete, with 0 or 1 homogamous pairs at base of upper racemes; racemes deflexed at maturity.

Flowering January to June. Forest margins. Common. Biome: Savanna and Grassland. Tropical Africa. This species links *H. hirta*, which does not have deflexed racemes, and *H. nyassae*, which has yellow raceme hairs, and may be a product of introgression between these species.

Description: Clayton et al. 1970–1982 (799), Clayton 1969 (82). Voucher: Pole Evans 3699. PRECIS code 9900730–01700.



***Hyparrhenia rudis* Stapf**

Robust perennial; rhizomatous and tufted (coarsely); 2000–3000 mm tall. Leaf blades 300–600 mm long; 3–18 mm wide. Spikelets (sessile) 5–6 mm long (pale or reddish brown, with silky white hairs, callus cuneate). Culms to 8 mm thick, exposed at base, with stilt roots; spatheoles 25–40 mm long; peduncles 10–20 mm long; raceme pairs with 4–7 awns 22–40 mm long; raceme bases subequal, flattened, short-appendaged; pedicellate spikelets villous, with an awn 2–6 mm long.

Flowering February to May. Moist soils. Locally common. Biome: Savanna and Grassland. Central Africa, Madagascar. Closely related to *H. dregeana*, *H. tamba* and *H. collina*, from which it is distinguished by its long awns and loosely tufted culms that increase in diameter above the lowest internodes, and to *H. schimperii*, which has glabrous or sparsely hairy pedicellate spikelets.

Description: Clayton et al. 1970–1982 (811), Clayton 1969 (128). Voucher: Scheepers 242. PRECIS code 9900730–01800.



Hyparrhenia rufa (Nees) Stapf var. *rufa*

Giant thatching grass, geelaar-tamboekiegras.

Perennial, or annual (sometimes); rhizomatous; 300–2500 mm tall. Leaf blades 300–600 mm long; 2–8 mm wide. Spikelets (sessile) 3.5–4.5 mm long (yellowish- to reddish-brown,



Fig. 109. *Hyparrhenia tamba*

often violet-tinged, usually glossy, glabrous or with scanty reddish-brown hairs, callus rounded or wedge-shaped, 0.2–0.8 mm long). Panicle lax or contracted; spatheoles linear, 40–50 mm long; raceme pairs with 7–14 awns 20–30 mm long; raceme bases terete, unequal.

Flowering December to June. Disturbed moist places and roadsides. Common. Biome: Savanna. Tropical Africa, introduced to America. Domestic use (thatching), or pasture (when young). A widespread, common and very variable species, best recognized by the glossy lower glume. It is closely related to *H. dichroa*, which has fewer awns and often has spatheoles clasping the raceme bases, and *H. poecilotricha*, which has longer sessile spikelets.

Description: Clayton et al. 1970–1982 (794), Clayton 1969 (62). Illustration: Hitchcock & Chase 1950 (fig. 1667). Voucher: Scheepers 215. PRECIS code 9900730–01900.

Hyparrhenia schimperi (A. Rich.) Stapf

Robust, erect perennial; shortly rhizomatous and tufted (coarsely); 2000–4000 mm tall. Leaf blades to 600 mm long; to 20 mm wide. Spikelets (sessile) 4–5 mm long (sparsely hairy to nearly glabrous, callus cuneate to acute). With stilt roots; culms to 8 mm thick; peduncles 10–15 mm long; raceme pairs with 6–8 awns 20–35 mm long; raceme bases subequal, flattened and short-appendaged; pedicellate spikelets glabrous to sparsely pilose.

Flowering December to May. Open moist places. Locally common. Biome: Fynbos, Savanna, and Grassland. Eastern Africa and Madagascar. Grades into *H. variabilis* which has fewer awns, and closely related to *H. rudis*, which has long hairs on the pedicellate spikelets.

Description: Clayton et al. 1970–1982 (808), Clayton 1969 (118). Voucher: Codd 208. PRECIS code 9900730–02000.



Hyparrhenia tamba (Steud.) Stapf

(=*H. glauca* Stent) 1.

Bloutamboekiegras, blue thatching grass.

Stout, robust perennial; rhizomatous and tufted (densely); 1000–3000 mm tall. Leaf blades to 800 mm long; 3–7 mm wide. Spikelets (sessile) 5 mm long (becoming dark purplish-grey, with long white hairs, callus cuneate). Sometimes with small stilt roots; culms to 4 mm thick; basal sheaths hairy; spatheoles 26–40 mm long; peduncles 20–30 mm long; raceme pairs with 5–8 awns 16–25 mm long; raceme bases subequal, flattened, short-appendaged; pedicellate spikelets villous.

Flowering December to June. Streamsides and roadsides. Common. Biome: Savanna and Grassland. Tropical Africa. Domestic use (thatching). Closely related to *H. collina* and *H. dregeana*, and possibly imperfectly separated from the latter, but distinguished by its combination of appendaged raceme base and few awns.

Description: Clayton et al. 1970–1982 (810), Clayton 1969 (126). Illustration: Chippindall 1955 (Pl. 24), Flower. Pl. Afr. (47: 1842). Voucher: Killick 2359. PRECIS code 9900730–02100.



Fig. 109.

Hyparrhenia umbrosa (Hochst.) Anderss. ex Clayton

Robust perennial; rhizomatous; 1300–2000 mm tall. Leaf blades to 600 mm long; to 12 mm wide. Spikelets (sessile) 4 mm long (with long white hairs, callus 0.4 mm long, oblong with rounded tip). With stilt roots; culms rambling and slender below, increasing to 6 mm across above; spatheoles 12–23 mm long; peduncles 3–13 mm long; raceme pairs with 4–6 awns 7–13 mm long; raceme bases flattened, subequal; pedicellate spikelets villous.



Flowering May, June, and July. Roadsides, old lands. Infrequent. Biome: Savanna and Grassland. Tropical Africa. Closely related to *H. cymbaria* and *H. rudis*, and possibly not a distinct species, but distinguishable by the rambling culm bases and oblong callus.

Description: Clayton et al. 1970–1982 (810), Clayton 1969 (127). Voucher: Pole Evans 3775. PRECIS code 9900730–02200.

Hyparrhenia variabilis Stapf

Robust perennial; rhizomatous; 1500–3000 mm tall. Leaf blades to 450 mm long; to 15 mm wide. Spikelets (sessile) 4–5 mm long (nearly glabrous to sparsely and shortly white-hairy, callus cuneate, 0.5–1.0 mm long). With stilt roots; culms 3.0–5.5 mm across; spatheoles 14–24 mm long; peduncles 3–9 mm long; raceme pairs with 3–5 awns 18–30 mm long; raceme bases subequal, flattened and short-appendaged; pedicellate spikelets glabrous, except margins ciliate.



Flowering January to May. Forest margins. Locally common. Biome: Savanna. Eastern Africa, Madagascar, Comoro Islands, Java. Grades into *H. cymbaria*, which has short ovate spatheoles and a square callus, and *H. schimperi*, which has more awns.

Description: Clayton et al. 1970–1982 (805), Clayton 1969 (113). Illustration: Clayton et al. 1970–1982 (fig. 185). Voucher: Galpin 8887. PRECIS code 9900730–02300.

Hyperthelia Clayton

Sometimes included in *Hyparrhenia*; including *H. dissoluta*.

Annual, or perennial; caespitose. Culms 1000–7500 mm high; herbaceous; branched above (to form compound inflorescences). Culm internodes hollow. Leaf blades linear; flat, or rolled (on drying). Ligule an unfringed membrane (usually), or a fringed membrane (rarely). Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (hermaphrodite and male); overtly heteromorphic.

Inflorescence of spike-like main branches, or panicle (a large, leafy false panicle); spatheate; a complex of 'partial inflorescences' and intervening foliar organs. Spikelet-bearing axes very much reduced, or 'racemes' (rarely); paired; with very slender rachides; disarticulating at the joints. 'Articles' appendaged (raceme-base with a long scarious appendage at the tip, which opposes the basal homogamous spikelets in the bud).

Spikelets in pairs, or in triplets (sometimes having one female-fertile spikelet with a pair of pedicellate male spikelets, the triplet disarticulating in its entirety); consistently in 'long-and-short' combinations; these pedicellate/

sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite (in the heterogamous combinations), or male-only (in the homogamous combinations). The pedicellate spikelets male-only. The homogamous and pedicellate spikelets male, linear-lanceolate, with two hyaline lemmas. Female-fertile spikelets 8–35 mm long; compressed dorsiventrally; falling with the glumes. Glumes two; more or less equal; awned (G2 sometimes aristate), or awnless; very dissimilar. Proximal incomplete florets 1; epaleate; sterile.



Fig. 110. *Hyperthelia dissoluta*

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline at margins and tips); incised; awned. Awns 1; median; from the sinus; geniculate; much longer than the body of the lemma. Palea present, or absent; when present conspicuous but relatively short, or very reduced. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit narrowly ellipsoid; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 6 species. Tropical and southern Africa. Mesophytic; in open habitats (grasslands and savanna); glycophytic. Namibia, Botswana, Transvaal, Swaziland, and Natal. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell & M. Koekemoer.

***Hyperthelia dissoluta* (Nees ex Steud.) Clayton**

Fig. 110. Pl. 97.

(=*Hyparrhenia dissoluta*
(Steud.) C.E. Hubb.) 1.

Geeltamboekiegras, yellow
thatching grass.

Robust perennial; tufted;
1000–3000 mm tall. Leaf blades
to 300 mm long; to 12 mm wide.
Spikelets (sessile) 6.5–7.5 mm long (pedicellate to 14 mm
long). Plant yellow and green; culms and awns yellow,
leaves and spikelets green; spikelets glabrous, lower glume
of sessile spikelets narrowly grooved, awns 50–100 mm
long.

Flowering throughout the year (mostly in autumn).
Roadsides and disturbed places. Common. Biome: Savanna.
Tropical Africa, Madagascar. Domestic use (thatching).

Description: Chippindall 1955 (512), Clayton et al.
1970–1982 (786). Illustration: Chippindall 1955 (fig. 410),
Clayton et al. 1970–1982 (fig. 183). Voucher: Compton
27058. PRECIS code 9900731–00100.

Imperata Cirillo

Syllepis Fourn.

Perennial; long-rhizomatous. Culms 100–1500 mm
high; herbaceous; unbranched above. *Ligule a fringed
membrane. Plants bisexual, with bisexual spikelets. The
spikelets all alike in sexuality; homomorphic.*

*Inflorescence paniculate (spiciform or loosely
contracted, the branches with numerous short 'racemes',
with dense silky white hairs); contracted; espatheate; not
comprising 'partial inflorescences' and foliar organs.
Spikelet-bearing axes short 'racemes'; with very slender
rachides; persistent.*

*Spikelets in pairs; consistently in 'long-and-short' com-
binations; unequally pedicellate in each combination.
Pedicels free of the rachis. The short-pedicellate spikelets
hermaphrodite. The long-pedicellate spikelets hermaphro-
dite. Female-fertile spikelets compressed dorsiventrally;
falling with the glumes (falling entire from their pedicels).
Glumes two; more or less equal; awnless; similar
(membranous, with long silvery hairs especially towards
the base). Proximal incomplete florets 1; paleate (rarely),
or epaleate; male (rarely), or sterile.*

Female-fertile florets 1. Lemmas less firm than the
glumes (hyaline); entire, or incised (denticulate); awnless.
Palea present; relatively long, or conspicuous but relatively
short, or very reduced (broad). Stamens 1, or 2 (rarely 3?).
Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base
number, $x = 5$ and 10. Panicoideae; Andropogonodae;
Andropogoneae; Andropogoninae. 8 species. Tropical and
subtropical. Helophytic, or mesophytic, or xerophytic; in

open habitats (often in damp or weedy places); maritime-
arenicolous (some forms of *I. cylindrica*), or glycophytic.
Namibia, Botswana, Transvaal, Orange Free State,
Swaziland, Natal, Lesotho, and Cape Province. 1 indige-
nous species.

Intergeneric hybrids procured with *Saccharum*.



Fig. 111. *Imperata cylindrica*

References. 1. Launert. 1970. FSWA. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

***Imperata cylindrica* (L.) Raeuschel**

(=*I. cylindrica* (L.)
Raeuschel var. *africana*
(Anderss.) C.E. Hubb.) 1, 2; (=*I.*
cylindrica (L.) Raeuschel var.
major (Nees) C.E. Hubb.) 1, 2.

Sygras, cottonwool grass,
donsgras, silverspike.

Perennial; strongly rhizomatous; 100–1200 mm tall. Leaf blades to 1500 mm long; 2–12 mm wide. Spikelets all alike 3–6 mm long. Leaves broad in the middle, narrowed at tip and base, reddish in winter; panicle dense, silky, white, cylindrical.

Flowering August to June. Riverbanks, vleis and seasonally wet places. Common. Biome: Fynbos, Savanna, and Grassland. Old World tropics. Weed (because the tough rhizomes make it difficult to eradicate).

Description: Chippindall 1955 (476), Clayton et al. 1970–1982 (700). Illustration: Chippindall 1955 (fig. 392), Clayton et al. 1970–1982 (fig. 159). Voucher: Gibbs Russell 2197. PRECIS code 9900370–00050.

Fig. 111. Pl. 98.



***Ischaemum* L.**

Argopogon Mimeur, *Collardoa* Cav., *Ischaemopogon* Griseb., *Meoschium* P. Beauv.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 100–3500 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear (usually), or linear-lanceolate to lanceolate; flat. *Ligule an unfringed membrane. Plants bisexual, with bisexual spikelets.* The spikelets of sexually distinct forms on the same plant, or all alike in sexuality; overtly heteromorphic (the pedicellate spikelet sometimes much smaller, often asymmetric), or homomorphic.

Inflorescence of spike-like main branches (terminal or axillary); digitate or subdigitate (usually); spatheate (uppermost leaf reduced to a spatheate sheath), or espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes'; paired, or clustered; with substantial rachides (these stout, triangular); disarticulating at the joints.

Spikelets in pairs; consistently in 'long-and-short' combinations; in pedicellate/sessile combinations, or unequally pedicellate in each combination. Pedicels free of the rachis. The 'shorter' spikelets hermaphrodite. The 'longer' spikelets hermaphrodite, or male-only (rarely), or sterile (rarely). Female-fertile spikelets compressed dorsiventrally; falling with the glumes. Glumes two; more or less equal; awned, or awnless; very dissimilar (lower coriaceous, usu. 2-keeled; upper 1-keeled above, sometimes awned). *Upper glume 5–11 nerved. Proximal incomplete florets 1; paleate, palea fully developed; male.*

Female-fertile florets 1. *Lemmas* less firm than the glumes (firmly membranous); *incised*; mucronate, or awned (usually). Awns when present 1; from the sinus (or mucronate); geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonodae; Andropo-

goneae; Andropogoninae. 60 species. Tropical and subtropical. Helophytic (mostly), or mesophytic, or xerophytic; in shade, or in open habitats (damp or shady places); maritime-arenicolous (e.g. *I. muticum*, *I. triticeum*), or glycophytic. Namibia, Botswana, Transvaal, Swaziland, Natal, and Cape Province. 2 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

1(0). Leaf blades green, usually reddish-tinged, usually wider than 5 mm, narrowing shortly to a sharp point; lower glume of sessile spikelets convex or flat, keels usually winged on upper half

. ***I. fasciculatum***

Leaf blades glaucous, usually narrower than 5 mm, drawn out into a long fine tip; lower glume of sessile spikelets concave, keels not winged

. ***I. afrum***



Fig. 112. *Ischaemum fasciculatum*

Ischaemum afrum (J.F. Gmel.) Dandy

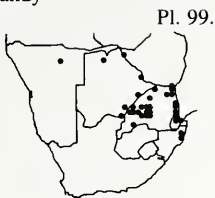
(=*I. brachyatherum* (Hochst.) Hack.) 1; (=*I. glaucostachyum* Stapf) 1.

Turfgrass, tweevingergras.

Perennial; rhizomatous; to 1200 mm tall. Leaf blades 100–500 mm long; 2–5(–11) mm wide. Spikelets (sessile) 5–8 mm long (pedicellate smaller). Leaves glaucous, tips tapering to a long, fine point; lower glume of sessile spikelets concave, keels not winged.

Flowering October to April. Black turf soil, usually near water. Common and locally dominant (sometimes). Biome: Savanna and Grassland. Throughout tropical Africa to India. Weed (ruderal).

Description: Chippindall 1955 (487), Clayton et al. 1970–1982 (747). Illustration: Clayton et al. 1970–1982 (fig. 175). Voucher: Giess, Volk & Bleissner 6436. PRECIS code 9900100–00100.



Pl. 99.

Ischaemum fasciculatum Brongn.

(=*I. arcuatum* (Nees) Stapf) 1.

Rooivleigras.

Perennial; rhizomatous; 300–900 mm tall. Leaf blades 50–250 mm long; (4–)5–16 mm wide. Spikelets (sessile) 5–6 mm long. Leaves green, becoming reddish-brown, tips narrowing shortly to a sharp point; lower glume of sessile spikelets convex or flat, keels usually winged on upper half; awns 5–10 mm long.

Flowering October to May. Wet places, vleis and riverbanks. Biome: Savanna and Grassland. Throughout tropical Africa to southeast Asia. Weed (ruderal). Occasional individuals with hairy leaves resemble *Eulalia villosa* in reddish colour and inflorescence form, but in *E. villosa* the lemma awns reach about 15–20 mm long.

Description: Chippindall 1955 (487), Clayton et al. 1970–1982 (749). Illustration: Chippindall 1955 (fig. 398). Voucher: De Winter & Wiss 4315. PRECIS code 9900100–00200.



Fig. 112.

Kaokochloa De Winter

Annual (all vegetative parts pilose); culms geniculate or prostrate at base, rooting at nodes. Culms 150–800 mm high; herbaceous; branched above. Leaf blades linear-lanceolate to lanceolate; flat, or rolled. Ligule a fringe of hairs.

Inflorescence panicle; open to contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 5–8 mm long; not noticeably compressed ('subglobose'); disarticulating above the glumes (or between the glumes, the upper glume falling with the spikelet); not disarticulating between the florets. Glumes two; more or less equal; about equalling the spikelets; awnless; similar. Lower glume 9 nerved, or 11 nerved. Incomplete florets distal to the female-fertile florets, merely underdeveloped, awnless (with only minute vestiges of awns); proximal incomplete florets absent.

Female-fertile florets 3–6. Lemmas without a germination flap; 9 nerved; incised (between excurrent nerves); awned. Awns 2, or 3, or 5; median and lateral (sometimes), or lateral only (the two marginal nerves excurrent into large awns, the median and other nerves occasionally contributing smaller awns). The median awn when present

similar in form to the laterals; apical; non-geniculate; when present much shorter than the body of the lemma to about as long as the body of the lemma. Palea present; relatively

Fig. 113. *Kaokochloa nigrirostris*

long (but narrower than the lemma). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR sheath outlines uneven. PCR sheath extensions absent. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chloridoideae; Pappophoreae. 1 species. Southern Africa. Xerophytic; in open habitats (in semi-desert); glycophytic. Namibia. 1 indigenous species.

References. 1. De Winter. 1961. *Bothalia* 7: 479.

Species treatment by G.E. Gibbs Russell.

***Kaokochloa nigrirostris* De Winter**

Annual; loosely tufted; 200–600 mm tall. Leaf blades 50–120 mm long; 5–10 mm wide. Spikelets to 7 mm long; to 6 mm wide. Culms decumbent; lemmas with two lateral nerves running out into large awns and central nerves forming smaller awns, lemmas curled inward at base of awns; awns glabrous, purple-tinged.

Flowering March to June. Flats and hillsides, in sandy or gravelly soil. Conservation status not known. Biome: Nama-Karoo. Endemic.

Description: De Winter 1961 (480). Voucher: De Winter & Leistner 5848. PRECIS code 9903611–00100.

Fig. 113. Pl. 100.



***Karroochloa* Conert & Tuerpe**

Sometimes included in *Rytidosperma*, *Danthonia* sensu lato.

Annual, or perennial; long-stoloniferous, or caespitose. Culms 40–400 mm high; herbaceous; unbranched above. Leaf blades linear; to 2 mm wide; flat, or folded, or rolled; not disarticulating. Ligule a fringe of hairs.

Inflorescence paniculate; contracted (10–60 mm long); more or less ovoid; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 4–6 mm long (rarely to 7 mm); compressed laterally; disarticulating above the glumes. Hairy callus present. Glumes two; more or less equal (subequal); about equalling the spikelets; awnless; similar (membranous, margins and apices hyaline). Incomplete florets distal to the female-fertile florets, merely underdeveloped, awned; proximal incomplete florets absent.

Female-fertile florets 3–7. Lemmas similar in texture to the glumes (membranous); hairy (with fringes or tufts of white hairs, except in *K. curva*, the hairs in tufts, or not in tufts; in transverse rows, or not in transverse rows); without a germination flap; 9 nerved; incised; awned. Awns 1, or 3; median, or median and lateral (by small extensions from the lobes). The median awn different in form from the laterals (when laterals present); from the sinus; geniculate; about as long as the body of the lemma to much longer than the body of the lemma. Palea present; relatively long (almost equalling the lemma); 2-nerved. Lodicules 2; fleshy; ciliate. Stamens 3. Ovary glabrous. Fruit small (0.8–1 mm); hilum short; pericarp fused; embryo small.

Photosynthetic pathway. C_3 ; $XyMS+$.

Cytology, classification, distribution. Chromosome base number, $x = 6$. Arundinoideae; Danthonieae. 4 species. Southern Africa. Mesophytic; in open habitats (grassland and among rocks); glycophytic. Namibia, Orange Free State, Natal, Lesotho, and Cape Province. 4 indigenous species.

References. 1. Conert & Tuerpe. 1969. *Senckenb. Biol.* 50: 333.

Species treatment by N.P. Barker.

- 1(0). Lemmas with hairs in tufts, glabrous between tufts; leaves and sheaths sparsely hispid 2
 Lemmas with a row of hairs across backs below awn base, glabrous or pubescent below this; leaves usually glabrous, but if pubescent then never hispid 3
- 2(1). Lemmas 3.0–3.5 mm long, including lobes; tufts of hairs on lemma up to 2 mm long; palea 2.8–3.2 mm long, sparsely pubescent between the margins and keels; perennial ***K. purpurea***
 Lemmas 1.8–2.5 mm long, including lobes; tufts of hairs not longer than 1.2 mm; palea 1.8–2.4 mm long, glabrous; annual ***K. tenella***
- 3(1). Plants annual; lemmas sparsely pubescent or glabrous below row of hairs across back, margins fringed with hairs ***K. schismoides***
 Plants perennial; lemmas densely pubescent below row of hairs across back, margins not obviously fringed ***K. curva***



Fig. 114. *Karroochloa curva*

Karroochloa curva (Nees) Conert & Tuerpe

(=*Danthonia curva* Nees) 1.

Perennial; stoloniferous and tufted; to 400 mm tall. Leaf blades to 250 mm long; to 2 mm wide. Spikelets 5–6 mm long; about 1.5 mm wide. Leaf sheaths usually glabrous; leaf blades flat or folded, usually glabrous, but if pubescent then never hispid; panicle 15–50 mm long; spikelets 3–6-flowered; glumes 3.5–6.0 mm long; lemmas 2.5–3.5 mm long including lemma lobes which extend into short, soft bristles; back of lemmas with a row of hairs across the middle below the awn base, densely pubescent below this, margins not obviously fringed; central awn 4.0–5.5 mm long; palea 2.2–2.5 mm long, pubescent between the keels.

Flowering October to May. In damp or shady habitats. Common. Biome: Fynbos, Nama-Karoo, and Grassland. Endemic. Natural pasture. Similar to *K. schismoides*, which is annual and has a fringe of hairs along the lemma margins. The flowering time is dependent on the seasonality of the rains.

Description: Conert & Tuerpe 1969 (295), Stapf 1898–1900 (532), Chippindall 1955 (243). Illustration: Conert & Tuerpe 1969 (fig. 2–8, spikelet parts only). Chippindall 1955 (fig. 214). Voucher: Du Toit 1999. PRECIS code 9902044–00100.

Karroochloa purpurea (L.f) Conert & Tuerpe

(=*Danthonia purpurea* (Thunb.) Beauv. ex Roem. & Schult.) 1.

Perennial; shortly rhizomatous and tufted; to 220 mm tall. Leaf blades to 40 mm long; to 1 mm wide. Spikelets 5–7 mm long; to 4 mm wide. Leaf sheaths sparsely hispid; blades rolled, falcate, sparsely hispid; panicle 10–20 mm long; spikelets 3–6-flowered; glumes 4–7 mm long, often tinged with dark purple around the keel; lemmas 3.0–3.5 mm long, including the truncate lemma lobes; backs of the lemmas with numerous tufts of hairs in a row across the middle of the back below the awn base as well as basal tufts near the margins and central nerve; hair tufts to 2 mm long; central awn 3–4 mm long, geniculate; palea 2.8–3.2 mm long, pubescent between the margin and keels.

Flowering July to May. In mountainous areas and in short grasslands. Common (roadsides). Biome: Fynbos, Grassland, and Nama-Karoo. Endemic. Natural pasture (for sheep). This species is similar to *K. tenella*, which is annual and has shorter tufts of hairs on the lemmas.

Description: Conert & Tuerpe 1969 (303), Stapf 1898–1900 (530), Chippindall 1955 (244). Illustration: Conert & Tuerpe 1969 (fig. 24–30), Chippindall 1955 (fig. 215). Voucher: Barker 33. PRECIS Code 9902044–00200.

Karroochloa schismoides (Stapf ex Conert) Conert & Tuerpe

Annual; tufted; 50–150 mm tall. Leaf blades to 60 mm long; about 0.5 mm wide. Spikelets 4.5–6.0 mm long; about 1 mm wide. Leaf sheath usually glabrous; leaf blades linear, open or rolled, glabrous or pubescent but then never hispid; panicle 10–20 mm long; spikelets 3–5-flowered; glumes 3.5–5.0 mm long; lemmas 2.5–4.0 mm long including lemma lobes which extend into short, soft bristles; back of lemmas with a fringe of hairs across the middle below the awn base,

Fig. 114.



sparsely pubescent or glabrous below this, with a fringe of hairs along each margin; central awn 3.0–4.5 mm long; palea 2.2–2.4 mm long, pubescent between the keels.

Flowering dependent upon rainfall, usually July to October. Dry mountains. Common (in the drier parts of the north west Cape and Namibia). Biome: Nama-Karoo and Succulent Karoo. Endemic. Similar to *K. curva*, which is a perennial and which has a densely pubescent lemma back.

Description: Conert & Tuerpe 1969 (299), Launert 1970 (160:125). Illustration: Conert & Tuerpe 1969 (fig. 13–19, spikelet parts). Voucher: Munro s.n. PRECIS code 9902044–00300.

Karroochloa tenella (Nees) Conert & Tuerpe

(=*Danthonia tenella* Nees) 1.

Annual; tufted; 40–150(–250) mm tall. Leaf blades 5–15 mm long; to 0.8 mm wide. Spikelets 4–7 mm long; to 2 mm wide. Leaf sheaths sparsely hispid; leaf blades rolled, falcate, sparsely hispid; panicle 5–20 mm long; spikelets 3–5-flowered; glumes 4–7 mm long, sometimes tinged with purple at apex; lemmas 1.8–2.5 mm long, including truncate lobes; backs of the lemmas with numerous tufts of hairs positioned in a row across the middle of the back below the awn base as well as basal tufts near the margins and central nerve; hair tufts 0.5–1.2 mm long; central awn 2.8–4.0 mm long, geniculate; palea 1.8–2.4 mm long, glabrous.

Flowering June to October. Sandy soils. Common (in disturbed areas). Biome: Fynbos, Nama-Karoo, and Succulent Karoo. Endemic. In the Van Rhynsdorp area plants can reach a height of 250 mm. Very similar to *K. purpurea*, which is perennial, shortly rhizomatous and has longer tufts of hairs on the lemmas.

Description: Conert & Tuerpe 1969 (308), Stapf 1898–1900 (531), Chippindall 1955 (244). Illustration: Conert and Tuerpe 1969 (fig. 36–41, spikelets parts only). Voucher: Davidse 33381. PRECIS code 9902044–00400.

Koeleria Pers.

Aegialina Schult., *Aegialitis* Trin., *Airochloa* Link, *Brachystylus* Dulac, *Ktenosachne* Steud., *Leptophyllochloa* Cald., *Poaron* Reichenb., *Wilhelmia* Koch, sometimes includes *Lophochloa* Reichenb., *Rostraria* Trin.

Annual (*Lophochloa*), or perennial; long-rhizomatous (rarely), or caespitose. Culms 50–1200 mm high; herbaceous. Leaf blades linear; flat, or folded, or rolled (convolute). *Ligule* an unfringed membrane (sometimes puberulent and ciliate).

Inflorescence paniculate; contracted (dense, cylindrical, ovoid, not interrupted); espatheate. Spikelet-bearing axes persistent.

Spikelets not secund; 4–7 mm long; compressed laterally; disarticulating above the glumes. Glumes two; very unequal, or more or less equal; markedly shorter than the spikelets, or about equalling the spikelets; awnless; similar. All florets female-fertile, or distal incomplete florets also present; proximal incomplete florets absent.

Female-fertile florets 2–4. Lemmas similar in texture to the glumes; carinate; 3–5 nerved; entire (usually), or incised (e.g. in *Lophochloa*); awnless, or mucronate, or awned (but the awns relatively inconspicuous, by contrast with *Trisetum*). Awns 1 (straight, subterminal, inconspicuous in the inflorescence); median; from the sinus, or dorsal; non-geniculate; much shorter than the body of the lemma to about as long as the body of the lemma.



Pl. 101.



Fig. 115. *Koeleria capensis*

Palea present; relatively long; thinner than the lemma (membranous). Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short, or long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. About 60 species. North and south temperate. Mesophytic, or xerophytic; mostly in open habitats (in dry grassland and rocky places). Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (1).

Intergeneric hybrids with *Trisetum*: *X Trisetokoeleria* Tsvetlev.

References. 1. Clayton. 1970. FTEA.

Species treatment by T.M. Sokutu.

Koeleria capensis (Steud.) Nees

(=*K. cristata* auctt., non (L.) Pers. var. *cristata*) 1; (= *K. cristata* var. *brevifolia* (Nees) C.E. Hubb.) 1; (= *K. cristata* var. *convoluta* (Steud.) C.E. Hubb.) 1.

Perennial; tufted (to densely so); 150–800 mm tall. Leaf blades



Fig. 115. Pl. 102.

40–200 mm long; 1–4 mm wide. Spikelets 3.5–4.0 mm long. Inflorescence spiciform, sometimes interrupted; spikelets 2–4-flowered, paleas projecting out of the florets and thus conspicuous in mature spikelets.

Flowering October to January. Common in montane areas, often among rocks and steep slopes, dry to wet areas. Locally common (in high altitudes in Natal), or locally dominant (sometimes). Biome: Fynbos and Grassland. Throughout Africa. Planted pasture (to an extent). I fail to see how this species differs from the temperate European *K. cristata* (L.) Pers. The comment by Clayton (1970) on differences in old leaf sheaths does not seem to hold and is considered subjective.

Description: Adams. & Salter 1950 (84), Stent 1924 in Bothalia (1:301), Stapf 1898–1900 (468), Chippindall 1955 (83), Clayton et al. 1970–1982 (79). Illustration: Chippindall 1955 (fig. 54). Voucher: Behr 899, Codd 3155. PRECIS code 9903740–00050.

Lagurus L.

Avena Scop.

Annual; caespitose. Culms 80–500(–600) mm high (slender); herbaceous; unbranched above. *Leaf blades linear-lanceolate*; flat. Ligule an unfringed membrane, or a fringed membrane (rarely).

Inflorescence paniculate; contracted; more or less ovoid (silky-white hairy & bristly); espatheate. Spikelet-bearing axes persistent.

Spikelets 5–10 mm long; compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; awned; similar (narrowly lanceolate, membranous, hairy, tapering into fine bristles, thinly membranous). *All florets female-fertile; proximal incomplete florets absent.*

Female-fertile florets 1. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (membranous); 5 nerved; incised; awned. *Awns 3*; median and lateral (with two short terminal laterals in addition to the longer median). The median awn different in form from the laterals; dorsal; geniculate; much longer than the body of the lemma. *Palea* present; relatively long (but shorter than the lemma). Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Aveneae. 1 species. Mediterranean. Xerophytic; in open habitats (especially maritime sands). Transvaal and Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by G.E. Gibbs Russell.

Lagurus ovatus L.

Haretail, haasgras.

Velvety annual; to 600 mm tall. Leaf blades to 100 mm long; to 10 mm wide. Spikelets 7–10 mm long (excluding long awns to 25 mm long). Panicle compact, oval, soft from profuse spreading glume hairs and fine awns from glumes and lemmas.

Flowering October to November (rarely later). Disturbed places, usually sandy soil. Locally common. Naturalized from the Mediterranean. Widely naturalized. Domestic use (dried flower arrangements).

Description: Chippindall 1955 (96). Illustration: Chippindall 1955 (fig. 68). Voucher: Jacot Guillarmod 3951. PRECIS code 9902610–00100.

Fig. 116. Pl. 103.



Fig. 116. *Lagurus ovatus*

Female-fertile spikelets secund; not in distinct 'long-and-short' combinations; 3.5 mm long; compressed laterally; falling with the glumes (in the clusters). The sterile spikelets with many florets, narrow-elongated. Glumes two; more or less equal; about equalling the spikelets; awned to awnless (acuminate to shortly aristate); similar (membranous, linear-lanceolate, hyaline). Incomplete florets distal to the female-fertile florets, awned (the sterile rudiment with a long awn); *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas papery; 4–5 nerved; incised; awned. Awns 1; median; dorsal; non-geniculate. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit ellipsoid; hilum short (linear).

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Poeae. 1 species. Mediterranean to Pakistan. Mesophytic, or xerophytic; in open habitats (in dry places). Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.

Fig. 117. *Lamarckia aurea*

Lamarckia Moench mut. Koeler

Achyrodes Boehmer, *Chrysurus* Pers., *Pterium* Desv., *Tinaea* Garzia.

Annual; caespitose. Culms 70–2000(–3000) mm high; herbaceous. Leaf blades flat. *Ligule an unfringed membrane*. The spikelets of sexually distinct forms on the same plant (only the terminal spikelet in each fascicle being hermaphrodite, the other 3–4 male-only or with 3–6 empty, awnless, truncate lemmas).

Inflorescence paniculate and a false spike, with clusters of spikelets on reduced axes; contracted; espatheate. *Spikelet-bearing axes disarticulating*; falling entire (the clusters of 3–5 spikelets falling whole).

Lamarckia aurea (L.) Moench.

(=*Cynosurus aureus* L.) 1.

Annual; loosely tufted (culms geniculate or erect); 100–200 (–300) mm tall. Leaf blades 30–90 mm long; 3–8 mm wide. Spikelets (sterile ones) 6–9 mm long; to 0.8 mm wide. Panicle 20–80 mm long, 10–25 mm wide, soft, silky; spikelets of two kinds, in fascicles of 4–5, terminal spikelet of each fascicle female-fertile, others sterile; female-fertile spikelet 1-flowered, to 2 mm long, pedicels 2–3 mm long, villous; lemma awn more than twice the length of the body; sterile spikelets consisting of two glumes and numerous imbricate, obtuse, awnless, empty lemmas.

Flowering August to October. Usually on road verges near tarmac in stony gravel or loam. Rare. Locally common. Naturalized from the Mediterranean basin. Biome: Fynbos. Mediterranean and Middle East, cultivated in USA. Ornamental and weed (insignificant).

Description: Linder (33), Stapf 1898–1900 (689), Hitchcock & Chase 1950 (187), Chippindall 1955 (61). Illustration: Chippindall 1955 (fig. 33), Hitchcock & Chase 1950 (fig. 369). Voucher: Crook 2195. PRECIS code 9903720–00100.

Fig. 117. Pl. 104.



0.2–0.6 mm long; plants widespread

L. hexandra
Keels of lemma and palea shortly ciliolate, with hairs less than 0.2 mm long; western Transvaal

L. denudata
3(1). Nodes glabrous; plants robust; culms spongy, 3–5 mm across
L. friesii
Nodes hairy; plants delicate; culms not spongy, 1 mm across
L. tisserantii

Fig. 118. *Leersia hexandra***Leersia** Swartz.

Aplexia Faf., *Asprella* Schreb., *Blepharochloa* Endl., *Ehrhartia* Weber, *Endodia* Raf., *Homalocenchrus* Mieg, *Laertia* Gromov, *Pseudoryza* Griff., *Turraya* Wall.

Perennial; long-rhizomatous, or long-stoloniferous, or caespitose. Culms 300–1500 mm high; herbaceous. Leaf blades linear; flat, or folded, or rolled. *Ligule an unfringed membrane*. The spikelets all alike in sexuality.

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 3–6 mm long; compressed laterally (strongly so); disarticulating above the glumes (or at least, above the rim assumed to represent them). *Rachilla terminated by a female-fertile floret. Glumes absent (apparently reduced to a narrow rim at the tip of the pedicel). Proximal incomplete florets absent.*

Female-fertile florets 1. Lemmas awnless, or mucronate (often caudate); 3–5 nerved. Palea present; relatively long (but much narrower than the lemma); with several nerves (3). Lodicules 2; fleshy, or membranous; glabrous. Stamens 1–6. Ovary glabrous. Fruit small; hilum long-linear; embryo small.

Transverse section of leaf blade. Mesophyll with arm cells, or without arm cells; without fusoids. Midrib with one bundle only, or vascularization complex (rarely).

Cytology, classification, distribution. Chromosome base number, $x = 12$. Bambusoideae; Oryzodae; Oryzeae. 18 species. Tropical and warm temperate. Helophytic; in shade and in open habitats. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 4 indigenous species.

References. 1. Clayton. 1970. FTEA. 2. Launert. 1971. FZ 10(1).

Species treatment by G.E. Gibbs Russell.

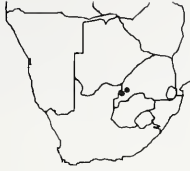
- 1(0). Spikelets more than 1 mm across; nodes hairy; plants not restricted to the Okavango and Caprivi 2
Spikelets less than 1 mm across; nodes glabrous or hairy; plants of the Okavango swamp 3
2(1). Keels of lemma and palea ciliate with stiff hairs

Leersia denudata Launert

Slender perennial; hydrophyte and tufted; to 700 mm tall. Leaf blades 30–140 mm long; 1.5–6.0 mm wide (flat or rolled, nearly smooth). Spikelets 3.5–4.5 mm long; 1.3–1.6 mm wide. Culm nodes velvety; lemma and palea with fine cilia less than 0.2 mm long.

Flowering February. Swampy grassland, vleis, deep parts of temporary pans. Rare. North to tropical east Africa.

Description: Clayton et al. 1970–1982 (27). Voucher: Kings 1620. PRECIS code 9901590–00100.

**Leersia friesii** Meld.

Perennial; hydrophyte and rhizomatous (rhizome creeping); 600–700 mm tall. Leaf blades 80–200 mm long; to 6 mm wide (flat, smooth). Spikelets 3.0–3.5 mm long; 0.9–1.0 mm wide. Culms spongy, nodes glabrous; lemmas sometimes subcaudate.

Flowering November to May. Swamps. Rare. Central and eastern tropical Africa.

Description: Clayton et al. 1970–1982 (27). Voucher: P.A. Smith 1806. PRECIS code 9901590–00150.

**Leersia hexandra** Swartz

Perennial; hydrophyte and rhizomatous (rhizome creeping); 300–1000 mm tall. Leaf blades 100–200 mm long; 4–8 mm wide (flat, strongly scabrous). Spikelets 3.4–4.8 mm long; 1.2–1.4 mm wide. Culm nodes hairy; lemma and palea keels with stiff cilia 0.2–0.6 mm long.

Flowering July to June. Floodplains and permanently wet places such as vleis, pans and ditches, often forming extensive colonies. Locally common. Throughout tropics. The leaves and culms make a characteristic rattling sound when shaken together.

Description: Chippindall 1955 (33), Clayton et al. 1970–1982 (27). Illustration: Chippindall 1955 (pl. 2). Voucher: V.d. Schijff 2115. PRECIS code 9901590–00200.

Fig. 118. Pl. 105.

**Leersia tisserantii** (A. Chev.) Launert

Perennial, or annual; hydrophyte, or rhizomatous (sometimes), or tufted (loosely to densely); 150–600 mm tall. Leaf blades 40–180 mm long; 1–2 mm wide (flat or rolled, strongly scabrous). Spikelets 4–5 mm long (excluding caudae); 0.8–1.0 (–1.1) mm wide. Culm nodes usually hairy; lemmas with a short flat cauda.

Flowering January to April. In deep water at river edges, growing in dense colonies. Rare. Central and eastern tropical Africa. Plants in our area have comparatively short caudae on the lemmas, but in tropical Africa these can be up to 7.5 mm long.

Description: Clayton et al. 1970–1982 (25), Launert. 1965. Senck. Biol. 46:129. Voucher: Gibbs Russell 2840. PRECIS code 9901590–00300.

**Leptocarydion** Stapf

Annual; loosely caespitose, or decumbent (rarely, rooting at the nodes). Culms 130–1300 mm high; herbaceous; branched above, or unbranched above. Leaf blades lanceolate to ovate; broad; flat, or rolled. Ligule a fringed membrane.

Fig. 119. *Leptocarydion vulpiastrum*

Inflorescence of spike-like main branches; contracted (to about 200 mm long, the thin spicate laterals appressed); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; 5–11 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. Glumes two; relatively large; very unequal; markedly shorter than the spikelets; awnless; similar (reddish, subhyaline, very narrow). Incomplete florets distal to the female-fertile florets, merely underdeveloped, awned; proximal incomplete florets absent.

Female-fertile florets 6–12. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (thin); without a germination flap; 3 nerved; incised; awned. Awns 1; median (the midnerve excurrent); from the sinus; non-geniculate (very slender); about as long as the body of the lemma to much longer than the body of the lemma. Palea present (linear-oblong); relatively long, or conspicuous but relatively short. Lodicules 2; fleshy; glabrous. Stamens 2, or 3. Ovary glabrous. Fruit small (to 1 mm); linear; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 1 species. East and southern Africa. Mesophytic. Namibia, Botswana, Transvaal, Swaziland, and Natal. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

***Leptocarydion vulpiastrum* (De Not.) Stapf**

Fig. 119. Pl. 106.

Spade grass.

Annual; loosely or compactly tufted; 400–1070 mm tall. Leaf blades 20–120 mm long; 6–20 mm wide. Spikelets 5–11 mm long. Leaf blades papery, lanceolate-oblong, rounded at base; panicle a narrow silky plume, 50–150 mm long.



Flowering February to June. Usually on sandy soil in mopane veld, riverine woodland or rocky hillsides, often in the shade. Infrequent to locally common. Biome: Savanna. Tropical Africa. Easily controlled weed, pasture, and ornamental (in grass gardens).

Description: Chippindall & Crook 1976 (177), Stapf 1898–1900 (648), Chippindall 1955 (127), Clayton et al. 1970–1982 (294). Voucher: De Winter 2905. PRECIS code 9903430–00100.

***Leptochloa* P. Beauv.**

Anoplia Steud., *Baldomiria* Herter, *Diachroa* Nutt., *Disacisperma* Kuntze, *Disakisperma* Steud., *Ipnium* Phil., *Leptostachys* Meyer, *Oxydenia* Nutt., *Rabdochloa* P. Beauv.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms woody and persistent, or herbaceous; branched above, or unbranched above. Leaf blades linear-lanceolate; flat, or rolled. Ligule an unfringed membrane to a fringe of hairs. The spikelets all alike in sexuality.

Inflorescence of spike-like main branches (spiciform racemes); open; digitate or subdigitate, or non-digitate (the racemes often whorled, rarely subdigitate); espatheate. Spikelet-bearing axes with very slender rachides; persistent.

Spikelets solitary; not in distinct 'long-and-short' combinations; 1–5 mm long (rarely up to 7); compressed laterally to not noticeably compressed; disarticulating above the glumes; disarticulating between the florets.

Callus short; blunt. Glumes two; very unequal, or more or less equal; markedly shorter than the spikelets; awnless. All florets female-fertile, or distal incomplete florets also present, these awnless; proximal incomplete florets absent.

Female-fertile florets 2–6 (usually 3–6, rarely 1). Lemmas less firm than the glumes to similar in texture to the glumes (membranous to hyaline); 3 nerved; entire (rarely), or incised; awnless, or mucronate, or awned. Awns when present 1; from the sinus; non-geniculate; much shorter than the body of the lemma. Palea present. Lodicules 2; fleshy. Stamens 2–3. Ovary glabrous. Fruit small (0.5–2 mm); hilum short; pericarp free, or loosely adherent, or fused; embryo large.

Photosynthetic pathway and related features. C₄; PCK (*L. ciliolata*), or NAD-ME (*L. digitata*); XyMS+. PCR sheath outlines uneven, or even. PCR sheath extensions present, or absent. Maximum number of extension cells when present 1. PCR cell chloroplasts ovoid, or elongated;

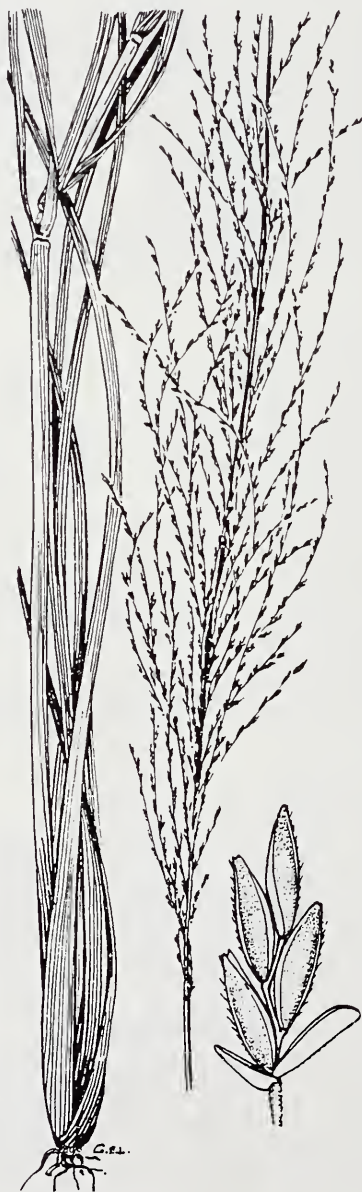


Fig. 120. *Leptochloa panicea*

with well developed grana; centrifugal/peripheral (*L. ciliolata*), or centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 27 species. Tropical and subtropical. Helophytic, mesophytic, and xerophytic; in shade and in open habitats (woodland, savanna, dry and swampy soils); halophytic and glycophytic. Namibia, Botswana, Transvaal, Swaziland, and Natal. 3 indigenous species.

References. 1. Clayton et al. 1974. FTEA. 2. Phillips. 1982. Kew Bull. 37:133.

Species treatment by M. Koekemoer.

- 1(0). Leaf blades lanceolate-oblong to oblong, 40–120 mm long, 6–18 mm wide; spikelets 1-flowered; glumes longer than the lemmas ***L. uniflora***
 Leaf blades linear; 100–500 mm long, 3–8 mm wide; spikelets 2–6-flowered; glumes shorter than the lemmas 2
 2(1). Plants perennial, aquatic or semi-aquatic; leaf sheaths white and glabrous; glumes unequal; lemmas with short dense hairs on the nerves; caryopses elliptic-oblong, longer than 0.5 mm ***L. chinensis***
 Plants annual, in bush or grassland; leaf sheaths and blades green and papillate-pilose; glumes subequal; lemmas with short hairs on the back; caryopses broadly elliptic, less than 0.5 mm long
 ***L. panicea***

***Leptochloa chinensis* (L.) Nees**

Perennial; hydrophyte, stoloniferous, and tufted; 440–820 mm tall. Leaf blades 200–500 mm long; 3.0–7.5 mm wide. Spikelets 2.1–3.2 mm long. Leaf sheaths white, papery and glabrous; panicle 200–600 mm long; spikelets 2–6-flowered; glumes unequal, shorter than the lemmas.

Flowering December to April. In or by water. Infrequent to locally common. Biome: Savanna. Southern tropical Africa through India to Japan and in Indonesia. Weed (ricefields).

Description: Clayton et al. 1970–1982 (279). Voucher: De Winter & Codd 315. PRECIS code 9903330–00100.

***Leptochloa panicea* (Retz.) Ohwi**

Annual; tufted; 320–1200 mm tall. Leaf blades to 250 mm long; about 7 mm wide. Spikelets 1.9–2.5 mm long. Leaf sheaths and blades papillate pilose, blades linear; panicle 200–300 mm long; spikelets (2–)3(–5)-flowered.

Flowering January to May. Clayey loam, in or near water. Rare. Biome: Savanna. Tropical Africa and tropical Asia.

Description: Chippindall 1955 (121), Clayton et al. 1970–1982 (279). Illustration: Chippindall 1955 (fig. 93), Clayton et al. 1970–1982 (fig. 76). Voucher: Acocks 16789. PRECIS code 9903330–00200.

***Leptochloa uniflora* A. Rich.**

(=*Craspedorhachis uniflora* (Hochst. ex A. Rich.) Chippind.) 1.

Slender annual; tufted; 300–610 mm tall. Leaf blades 40–120 mm long; 6–18 mm wide. Spikelets 1.9–2.8 mm long. Leaf blades lanceolate-oblong to oblong;

panicle 150–450 mm long; spikelets 1-flowered.

Flowering January to May. In bushveld under trees. Rare. Locally common. Biome: Savanna. Tropical Africa, India and Ceylon.

Description: Chippindall 1955 (205), Clayton et al. 1970–1982 (276). Illustration: Chippindall 1955 (fig. 182). Voucher: Killick & Leistner 3347. PRECIS code 9903330–00300.

***Lepturus* R.Br.**

Lepturus Dum., *Leptocercus* Raf., *Monerma* P. Beauv.

Perennial; long-stoloniferous and caespitose. Culms 100–600 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear to linear-lanceolate; flat, or rolled (involute). *Ligule an unfringed membrane*.

Inflorescence a single spike (almost cylindrical, the joints striate); espatheate. Spikelet-bearing axes disarticulating; disarticulating at the joints.

Spikelets solitary; distichous; 3–15 mm long (–20 mm); compressed dorsiventrally; falling with the glumes. Glumes one per spikelet (G1 usually missing), or two; very unequal; long relative to the adjacent lemmas (i.e., G2); awnless, or awned (G2 sometimes tapered into a short awn); very dissimilar (lower reduced to a minute triangular scale; upper exceeding the spikelet, thickened, with rows of minute bristles on the back). Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.



Fig. 120. Pl. 107.

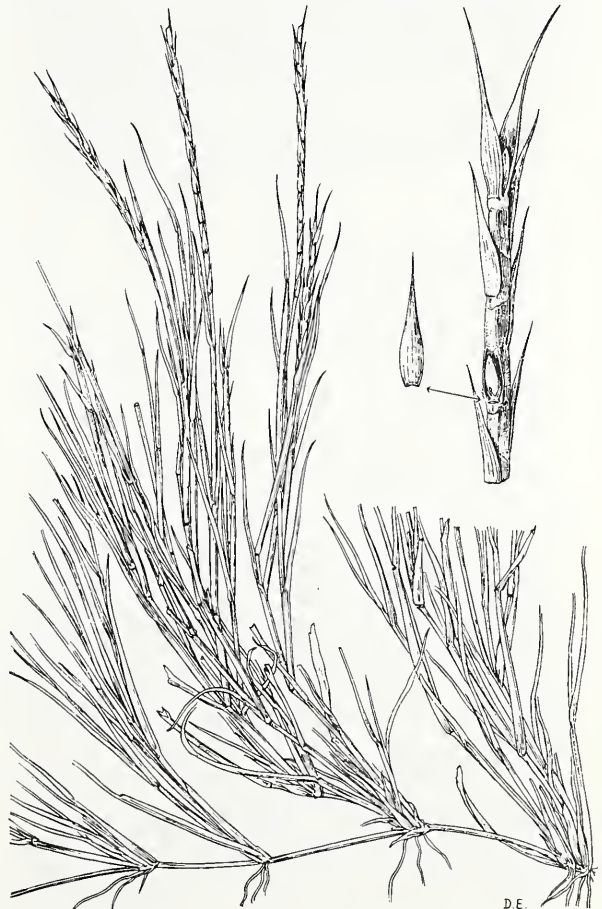
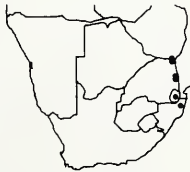


Fig. 121. *Lepturus repens*

Female-fertile florets 1–2. Lemmas less firm than the glumes (membranous); 3 nerved; entire; awnless. Palea present (lanceolate); relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit ellipsoid; hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR sheath outlines uneven, or even. PCR sheath extensions absent.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. About 8 species. Coastal east Africa, Madagascar, to Australia, & Polynesia. Xerophytic; in open habitats (sandy beaches and coastal hinterland); maritime-arenicolous (usually, a good sandbinder). Natal. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by G.E. Gibbs Russell.

Lepturus repens (G. Forst.) R. Br.

Fig. 121. Pl. 108.

Perennial; stoloniferous; 100–600 mm tall. Leaf blades to 150 mm long; 2–10 mm wide. Spikelets (8–)10–14(–22) mm long. Inflorescence a fragile spike with the spikelets sunk on opposite sides of the corky axis; lower glume absent, upper glume awned; florets 1 or 2.

Flowering September to October. Sand dunes, in salt spray zone. Infrequent. Shores of the Indian Ocean east to Polynesia. Erosion control (sand binder). This species is strikingly similar to *Hainardia cylindrica*, which is an annual. The inflorescence is superficially similar to *Hemarthria* and allied andropogonoids, in which the spikelets are paired.

Description: Clayton et al. 1970–1982 (391). Illustration: Clayton et al. 1970–1982 (fig. 104). Voucher: Venter 6274. PRECIS code 9904420–00100.



Leucophrys Rendle

Sometimes included in *Brachiaria*.

Perennial. Culms 70–1000 mm high; woody and persistent (stiffly geniculate); branched above (plants bushy). Leaf blades linear-lanceolate; flat, or rolled. Ligule a fringe of hairs.

Inflorescence paniculate; contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary, or in pairs; with pedicellate spikelets (the spikelets subspituate, with a short stalk fitting into the pedicel apex); consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations. Spikelets 4–6 mm long; abaxial to adaxial (the orientation variable); compressed dorsiventrally; falling with the glumes. Glumes two; relatively large; very unequal, or more or less equal; with distinct rows of hairs (the upper with a transverse row above the middle, the lower glabrous save at the base); awnless (but the tips caudate, inrolled, membranous); very dissimilar (lower obtuse or notched at apex, pilose at base, the upper tapering, caudate, dorsally long-villous with a transverse fringe just above the middle). Proximal incomplete florets 1; paleate, palea fully developed; male.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; smooth; becoming indurated (glossy); hairless; having the margins tucked in onto the palea; with a clear germination flap (basal); 5 nerved; entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous.

Photosynthetic pathway. C_4 ; $XyMS+$. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Panicoideae; Panicoideae; Paniceae. 1 species. Tropical and southern Africa. Helophytic, or xerophytic; in open habitats (sandy riverbeds in semidesert); glycophytic. Namibia and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Launert. 1970. FSWA.

Species treatment by H.M. Anderson.

Leucophrys mesocoma (Nees) Rendle

Fig. 122. Pl. 109.

Withaargras.

Perennial; tufted; to 1000 mm tall. Leaf blades 30–120 mm long; 3–8 mm wide. Spikelets 7 mm long; 2–3 mm wide. Culms woody, blue-green, profusely branched, geniculate, nodes swollen; panicle 130 mm long, 30



Fig. 122. *Leucophrys mesocoma*

mm wide; upper glume and lemma of lower floret with dense hairs 3–5 mm long in two tufts or a continuous fringe halfway up.

Flowering February to May. Sandy riverbeds. Infrequent. Biome: Nama-Karoo. Angola. Natural pasture. Species of *Melinis* have a similar inflorescence. This species may be distinguished by its much branched habit.

Description: Chippindall 1955 (379). Illustration: Muller 1984 (186), Chippindall 1955 (fig. 325). Voucher: Smook 5261. PRECIS code 9901030–00100.

Lintonia Stapf

Joannegria Chiov., *Negria* Chiov.

Perennial; caespitose, or long-rhizomatous and caespitose. Culms 200–900 mm high; herbaceous; branched above. Leaf blades linear (tapered to a fine, acuminate tip); flat. Ligule an unfringed membrane (minutely ciliate, with long hairs at the auricle positions).

Inflorescence of spike-like main branches; open; digitate or subdigitate, or non-digitate (*L. brizoides*); espatheate (but often enveloped below by the sheath of the uppermost culm leaf). The racemes without spikelets towards the base. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate, or not two-ranked; 4–11 mm long (cuneate or elliptic, plump); compressed laterally; dis-

articulating above the glumes; *not disarticulating between the florets (the rachilla tough)*. Glumes two; very unequal (G1 shorter); markedly shorter than the spikelets; awnless (sub-mucronate); similar (persistent, hyaline-membranous). Incomplete florets distal to the female-fertile florets, merely underdeveloped, shortly awned; proximal incomplete florets absent.

Female-fertile florets 2–4 (with several sterile ones above). Lemmas decidedly firmer than the glumes (tough and cartilaginous, at least in part); without a germination flap; 5–9 nerved; incised (shortly so); awned. Awns 1; median; dorsal; non-geniculate (curved); much shorter than the body of the lemma to about as long as the body of the lemma. Palea present; relatively long (about 3/4 the length of the lemma). Lodicules 2; fleshy (cylindrical rather than cuneate); glabrous. Stamens 3. Ovary glabrous. Fruit small (1.3–2.2 mm); ellipsoid; hilum short (elliptical); pericarp free; embryo large (about half the length of the fruit).

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines uneven. PCR sheath extensions absent. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 2 species. Tropical east Africa. Helophytic, or mesophytic; in shade, or in open habitats (savanna, heavy soils in seasonally wet places); glycophytic. Botswana, Transvaal, Swaziland, and Natal. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Lintonia nutans Stapf

Fig. 123. Pl. 110.

Perennial; shortly stoloniferous and tufted; 400–900 mm tall. Leaf blades 30–150 mm long; 3–5 mm wide. Spikelets 6–10 mm long; 4–8 mm wide. Leaf blades usually glabrous; inflorescence of 2–4 digitate or subdigitate racemes; spikelets 4–10-flowered, wedge-shaped; lemma shortly bilobed, with an awn 1–11 mm long between the lobes.

Flowering December to March. On black clayey soil in vleis or along pan edges. Conservation status not known. Infrequent. Biome: Savanna. East Africa.

Description: Chippindall 1955 (117), Clayton et al. 1970–1982 (302). Voucher: Du Toit 169. PRECIS code 9902020–00100.



Lolium L.

Arthrochortus Lowe, *Craepalia* Schrank, *Crypturus* Link.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 100–1300 mm high; herbaceous; unbranched above. Leaves auriculate. Sheath margins free. Leaf blades linear; flat, or folded, or rolled. Ligule an unfringed membrane.

Inflorescence a single spike; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; conspicuously distichous; 7–26 mm long; compressed laterally; disarticulating above the glumes. Glumes one per spikelet (except that the terminal spikelet has two); decidedly shorter than the adjacent lemmas, or long relative to the adjacent lemmas; awnless. Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2–22. Lemmas less firm than the glumes to decidedly firmer than the glumes (membranous



G.E.L.

Fig. 123. *Lintonia nutans*

to papery, sometimes turgid or hardening in fruit); 5–7 nerved; entire, or incised; awnless, or awned. Awns when present 1; from the sinus, or dorsal; non-geniculate; much shorter than the body of the lemma. Palea present; relatively long (usually ciliate). Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small, or medium sized, or large; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Poeae. 8 species. Temperate Eurasia, north Africa. Mesophytic; in open habitats. Namibia, Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. 3 naturalized species.

Intergeneric hybrids with *Festuca* — *X Festulolium* Aschers. & Graebn. (several species of each genus involved).

References. 1. Chippindall. 1955. Gr. & Past. 2. Humphries. 1980. Fl. Europ. 3. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.



Fig. 124. *Lolium temulentum*

- 1(0). Glumes appressed to the rachis, slightly gaping at maturity, concealing or partly concealing the spikelets in the concavities of the rachis; spikelets 1–3 mm wide **L. rigidum**

- Glumes ascending or spreading, not concealing the spikelets; spikelets 3–11 mm wide 2
2(1). Lemmas elliptical to ovate, very turgid at maturity especially towards the base; mature caryopses to 3 times as long as wide **L. temulentum**
Lemmas oblong to oblong-lanceolate, not turgid at maturity; mature caryopses more than 3 times as long as wide 3
3(2). Lemmas awned, awn up to 15 mm long; sterile leafy shoots absent; leaves convolute when young
..... **L. multiflorum** / **L. multiflorum** x **L. perenne**
Lemmas awnless; plants with sterile leafy shoots; leaves flat or folded when young 4
4(3). Plants perennial; leaf blades 2–4 mm long
..... **L. perenne**
Plants annual or biennial; leaf blades to 10 mm wide **L. multiflorum** x **L. perenne**

***Lolium multiflorum* Lam.**

Italian rye grass.

Pl. 111.



Shortlived perennial, or annual; loosely tufted; 200–800 (–1300) mm tall. Leaf blades 110–220 mm long; 3–8 mm wide. Spikelets 8–20 mm long; 2–10 mm wide. Glumes ascending or spreading, not concealing the spikelets, 1/4–1/2 (–3/4) the spikelet length; lemmas acute, not turgid at maturity, awn to 15 mm long; mature caryopsis more than three times as long as wide.

Flowering October to April. On roadsides and other disturbed areas. Common. Naturalized from Europe and the Mediterranean area. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Introduced worldwide. Irrigated annual winter pasture, or poisonous (when infected by fungi), or weed (an escape from cultivation). Subjectively separated from *L. multiflorum* x *L. perenne* by numerous overlapping characters.

Description: Humphries 1980 (5:154), Stapf 1898–1900 (739), Hitchcock & Chase 1950 (272), Chippindall 1955 (59). Illustration: Chippindall 1955 (fig. 29), Hitchcock & Chase 1950 (fig. 534). Voucher: Smook 1705. PRECIS code 9904330–00200.

Lolium multiflorum* x *L. perenne

Shortlived perennial, or annual; loosely tufted; 150–1000 mm tall. Leaf blades to 300 mm long; to 10 mm wide. Spikelets 6–25 mm long; 3–10 mm wide. Glumes ascending or spreading, not concealing the spikelets, 1/4 to as long as the spikelets; lemmas not turgid at maturity, more or less acute, awns absent or up to 10 mm long; mature caryopsis more than three times as long as wide.



Flowering October to December. In cultivated or fallow lands, on roadsides and in moist disturbed places. Locally common. Naturalized from Europe. Biome: Fynbos and Grassland. Europe, widely cultivated. Cultivated pasture and weed (an escape from cultivation). In Europe, *L. multiflorum* and *L. perenne* are two quite distinct species, but they hybridize freely to form a complete range of intermediates in southern Africa. This hybrid is subjectively separated from *L. multiflorum* by numerous overlapping characters.

Description: Linder (21), Humphries 1980 (5:154). Voucher: Theron 927. PRECIS code 9904330–00250.

***Lolium perenne* L.**

Perennial rye grass.

Perennial; tufted (with numerous culms and sterile leafy shoots); 250–500(–900) mm tall. Leaf blades 50–140(–300) mm long; 2–4 mm wide. Spikelets 10–15 mm long; 3–10 mm wide. Glumes ascending or spreading, not concealing the spikelets, 1/2–3/4 the spikelet length; lemmas acute, not turgid at maturity, awnless; mature caryopsis more than three times as long as wide.

Flowering March, April, November, and December. On roadsides, in moist disturbed areas and cultivated and fallow lands. Locally common. Naturalized from Europe. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Introduced worldwide. Irrigated perennial winter pasture, or poisonous (when infected by fungi), or weed (an escape from cultivation). Hybridizes freely with other *Lolium* species, as well as with species of *Festuca*.

Description: Humphries 1980 (5:154), Hitchcock & Chase 1950 (269), Chippindall 1955 (58). Voucher: Burrows 2216. PRECIS code 9904330–00300.

***Lolium rigidum* Gaudin**

(=*L. loliaceum* (Bory & Chaup.) Hand.-Mazz) 3.

Annual; tufted (with numerous flowering culms or solitary culms in young plants; culms branched near the base and sometimes rooting from the lower nodes); 100–300(–500) mm tall. Leaf blades 100–170 mm long; 5–8 mm wide. Spikelets 7–20 mm long; 1–3 mm wide. Spikelets 2-flowered; glumes appressed to the rachis, slightly gaping at maturity, concealing or partly concealing the spikelets in the concavities of the rachis, 3/4 to slightly longer than the spikelets; lemmas obtuse to acute, not turgid at maturity, awn absent or to 10 mm long; mature caryopsis more than three times as long as wide.

Flowering September to January. In disturbed and weedy places on sandy to clayey soils, preferably where it is moist, occasionally in water and on stream edges. Locally common. Naturalized from the Mediterranean. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Desert. Introduced worldwide in temperate regions. Weed. Similar in size and habit to *Hainardia cylindrica*, which has one-flowered spikelets.

Description: Humphries 1980 (5:154), Stapf 1898–1900 (740), Chippindall 1955 (59). Voucher: Smook 3649. PRECIS code 9904330–00350.

***Lolium temulentum* L.**

Drabok, darnel.

Robust annual; culms solitary or tufted; 400–900 mm tall. Leaf blades 150–300 mm long; 3–7 mm wide. Spikelets 8–28 mm long; 3–8 mm wide. Glumes ascending or spreading, not concealing the spikelets, 3/4 to 1 1/2 times the spikelet length; lemmas elliptical to ovate, very turgid at maturity, awn absent or to 20 mm long; mature caryopsis 2–3 times as long as wide.

Flowering September to February. Usually in cultivated or fallow lands, gardens or other disturbed areas, often associated with wheat. Locally common. Naturalized from the Mediterranean. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Naturalized in most warm temperate

countries. Weed. The fungus associated with this grass contains an alkaloid poisonous to livestock.

Description: Humphries 1980 (5:154), Stapf 1898–1900 (738), Hitchcock & Chase 1950 (272), Chippindall 1955 (59). Illustration: Chippindall 1955 (fig. 30), Hitchcock & Chase 1950 (fig. 535). Voucher: Lategan s.n. PRECIS code 9904330–00400.

***Lophachme* Stapf**

Perennial; caespitose. Culms 130–570 mm high; herbaceous; unbranched above (though branching below). Leaf blades linear-lanceolate; rolled (involute). Ligule an unfringed membrane (in *L. parva*), or a fringed membrane (in *L. digitata*).

Inflorescence of spike-like main branches (a panicle of slender spike-like racemes); digitate or subdigitate; espathate, or spatheate (in that the spikelets sometimes subtended by very minute, sparsely hairy, hyaline scales — vestigial bracts or spikelets?). Spikelet-bearing axes with very slender rachides; persistent.

Spikelets solitary (somewhat distant); biseriate; 3.5–6 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets; with distinctly elongated rachilla internodes between the florets (between L1 and L2 and above L2). Callus pointed. Glumes two; very unequal (G1 shorter), or more or less equal; markedly shorter than the spikelets to about equalling the spikelets;



Fig. 124.

Fig. 125. *Lophachme digitata*

awnless; similar (linear-lanceolate, membranous). Incomplete florets distal to the female-fertile florets, about 4, clearly specialised and modified in form (reduced to awns, forming a tuft which remains attached to the upper fertile floret), awned; *proximal incomplete florets absent*.

Female-fertile florets 1, or 2 (the second floret sometimes male-only). Lemmas less firm than the glumes (thinly membranous); without a germination flap; 3 nerved; incised; awned. Awns 1; median; from the sinus; non-geniculate (fine, straight or recurved); about as long as the body of the lemma to much longer than the body of the lemma. Palea present; relatively long (reaching the bases of the lemma lobes). Lodicules somewhat fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (1.8 mm long); fusiform; hilum short; pericarp loosely adherent (easily removable after soaking); embryo large (a little more than 1/3 the length of the fruit).

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 2 species. Southern tropical and southern Africa. Helophytic, or mesophytic (open grassland or streamsides); in shade (*L. parva*), or in open habitats (*L. digitata*); glycophytic. Transvaal and Natal. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.

Lophachme digitata Stapf

Fig. 125. Pl. 112.

Slender perennial; rhizomatous and tufted; 170–570 mm tall. Leaf blades 30–45 mm long; 1.0–2.5 mm wide. Spikelets 5–6 mm long. Rhizome long and slender; basal sheaths fibrous; spikes 2–8, to 80 mm long; central nerve of lemma extending to an awn longer than the floret.



Flowering February to April. Open highveld sourveld. Infrequent to locally common. Biome: Savanna and Grassland. Endemic.

Description: Stapf 1898–1900 (647), Chippindall 1955 (127). Illustration: Hooker's Icon. Pl. (pl. 2611), Chippindall 1955 (fig. 101). Voucher: Codd 974. PRECIS code 9903520–00100.

Lophochloa Reichenb.

Acrospelion Schult., *Parvotrisetum* Chrték, *Rupestrina* Prov., *Sennenia* Sennen, *Trisetaria* Forssk., *Trisetarium* Poir., sometimes includes *Rostraria* Trin.

Annual (*Trisetaria*), or perennial; long-rhizomatous, or caespitose. Culms 40–1500 mm high; herbaceous. Leaf blades linear; flat, or rolled (convolute). Ligule an unfringed membrane (sometimes puberulent or ciliate). The spikelets all alike in sexuality.

Inflorescence paniculate; open, or contracted (loose, or if dense then interrupted, neither cylindrical nor ovoid); espatheate. Spikelet-bearing axes persistent.

Spikelets not secund; 2.4–9 mm long; compressed laterally; disarticulating above the glumes, or falling with the glumes, or not disarticulating. Hairy callus present (usually). Glumes two; very unequal, or more or less equal; markedly shorter than the spikelets, or about equalling the spikelets; awnless; similar. All florets female-fertile, or distal incomplete florets also present; *proximal incomplete florets absent*.

Female-fertile florets 1 (rarely), or 2–5, or 6–12 (rarely). Lemmas similar in texture to the glumes; carinate; 3–7

nerved; *incised*; awned (usually conspicuously, contrast *Koeleria*, rarely awnless). Awns when present 1, or 3; median, or median and lateral (via setae from the lobes). The median awn different in form from the laterals (when laterals present); usually dorsal (or 'subterminal'); usually twisted; non-geniculate, or geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma (conspicuous if inflorescence compact). Palea present; relatively long. Lodicules 2; membranous; ciliate, or glabrous. Stamens 3. Ovary usually glabrous. Fruit small, or medium sized; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 6$ and 7. Pooideae; Poodae; Aveneae. About 85 species. North & south temperate. Mesophytic, or xerophytic; mostly in open habitats (meadows, mountain slopes, upland grasslands, weedy places); glycophytic. Namibia and Cape Province. 2 naturalized species.

Inteneric hybrids with *Koeleria* (*X Trisetokoeleria* Tsvelev), *Sphenopholis*.



Fig. 126. *Lophochloa pumila*

References. 1. Jonsell. 1980. Fl. Europ. 5. 2. PRE Herbarium practice, following Smook & Gibbs Russell.

Species treatment by T.M. Sokutu.

- 1(0). Spikelets 3–4-flowered; upper glume densely pubescent, lower one less so **L. pumila**
Spikelets 3–6-flowered; glumes glabrous to pubescent or lower glume pubescent and upper glume glabrous **L. cristata**

Lophochloa cristata (L.) Hyl.

(= *Koeleria phleoides* (Vill.) Pers.) 1.

Annual; loosely tufted; 50–400 mm tall. Leaf blades 40–120 mm long; to 2.5 mm wide. Spikelets 3–5 mm long. Inflorescence spiciform; spikelets 3–6-flowered; glumes glabrous to pubescent, or lower glume pubescent and upper glume glabrous; lemma awn 1–3 mm long.

Flowering October to December. Dry exposed areas or sometimes also in moist or rocky areas. Infrequent. Naturalized from Europe and the Mediterranean area. Biome: Fynbos. North Africa and Europe to India. Weed. Can be confused with *L. pumila*, especially when the lowermost lemma is pubescent and the rest of the spikelet is less hairy or glabrous.

Description: Adams. & Salt. 1950 (84), Jonsell 1980 (5:220), Stapf 1898–1900 (470), Chippindall 1955 (84). Voucher: Cleghorn 3144. PRECIS code 9903741–00100.



Lophochloa pumila (Desf.) Bor

(= *Trisetaria pumila* (Desf.) Maire) 2; (= *Trisetum pumilum* (Desf.) Kunth) 1.

Annual; tufted; 45–400 mm tall. Leaf blades 35–65 mm long; to 2 mm wide. Spikelets 2.5–4.0 mm long. Inflorescence spiciform; spikelets 2–4-flowered; lower glume glabrous to puberulous, ciliate on the keel; upper glume densely pubescent; lemma awn 1.5–4.0 mm long.

Flowering September to January. Dry and/or rocky areas, sometimes beneath bushes. Infrequent. Naturalized from Europe. Biome: Fynbos and Succulent Karoo. Spain. Weed. Can easily be confused with *L. cristata*, which has less hairy glumes and sometimes a shorter lemma awn.

Description: Jonsell 1980 (5:220), Stapf 1898–1900 (471), Chippindall 1955 (84). Illustration: Chippindall 1955. Voucher: Acocks 15020, Smook 3652. PRECIS code 9903741–00200.

Fig. 126. Pl. 113.



Loudetia Steud.

Annual (rarely), or perennial; caespitose. Culms (250–)400–5000 mm high; herbaceous (usually erect, slender or robust); branched above, or unbranched above. Leaf blades linear (often rigid); flat, or rolled (convolute). Ligule a fringed membrane (narrow), or a fringe of hairs. Plants with hermaphrodite florets.

Inflorescence paniculate; open, or contracted (rarely more or less spiciform); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary, or in pairs; consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations. Spikelets 6–25 mm long; compressed laterally to not noticeably compressed; disarticulating above the glumes. Glumes two; relatively large; very unequal; awned, or awnless (G2 may be setaceous-acuminate); similar. Lower glume 3 nerved; shorter than the female-fertile lemma. Proximal incomplete florets 1; paleate, or epaleate (*L. togoensis*), palea when present fully developed (membranous, two keeled); male, or sterile.

Female-fertile florets 1. Lemmas similar in texture to the glumes, or decidedly firmer than the glumes; not becoming indurated (more or less leathery); hairy to hairless (pilose to glabrescent, the hairs not in tufts; not in transverse rows); the margins tucked in onto the palea; without a germination flap; 5–9 nerved; incised (usually shortly so, rarely entire); awned. Awns 1; median; from the sinus; geniculate; much longer than the body of the lemma. Palea present (linear); relatively long. Lodicules 2; fleshy; glabrous. Stamens 2 (rarely 3). Ovary glabrous. Stigmas brown. Hilum long-linear; embryo large.

Photosynthetic pathway. C₄. Organization of PCR tissue when unconventional *Arundinella* type. XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 6$ and 12. Panicoideae; Panicoideae; Arundinelleae. About 26 species. Tropical and southern Africa, Madagascar, with 1 in South America. Helophytic, or mesophytic, or xerophytic; in open habitats (in savanna woodland, often on poor shallow soils); glycophytic. Namibia, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. 6 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton et al. 1972. FTEA.

Species treatment by H.M. Anderson.

- 1(0). Spikelets in triads, 20–30 mm long . . . **L. pedicellata**
Spikelets in pairs or solitary, less than 15 mm long 2
2(1). Inflorescence dense and spike-like . . . **L. densispica**
Inflorescence an open panicle 3
3(2). Glumes obtuse or truncate 4
Glumes acute or minutely awned 5
4(3). Callus of female-fertile (upper) floret two-toothed; leaves may be loosely hairy **L. simplex**
Callus of female-fertile (upper) floret pointed, truncate or rounded; leaves densely covered with velvety white hairs **L. lanata**
5(3). Culms with leaves few at base, branched after first node; spikelets 6–8 mm long **L. filifolia**
Culms very leafy at base, unbranched after first node; spikelets 8–12 mm long **L. flavidia**

Loudetia densispica (Rendle) C.E. Hubb.

Perennial; tufted; to 900 mm tall. Leaf blades 100–200 mm long; to 3 mm wide. Spikelets 10–15 mm long. Panicle 40–80 mm long, spikelike and dense; lower glume obtuse, with 2 rows of tubercles; upper glume and lower lemma usually glabrous; callus of female-fertile (upper) floret 2-toothed.

Flowering January. Open grassland. Locally common (Komati River). Biome: Savanna. Angola, Lower Guinea.

Description: Chippindall 1955 (283). Illustration: Chippindall 1955 (fig. 254). Voucher: Acocks 13308. PRECIS code 9901751–00100.



Loudetia filifolia Schweick.

Slender, wiry perennial; tufted; to 600 mm tall. Leaf blades to 100 mm long; filiform or to 2 mm wide. Spikelets 6–8 mm long. Culms thin, branched, after the first node; glumes acute or shortly awned; callus of female-fertile (upper) floret truncate or rounded.



Flowering November to June. Rock crevices on cliffs and mountain slopes. Infrequent. Biome: Savanna. Can be distinguished from *L. flavida*, which has larger spikelets (8–12 mm long) and wider leaves (2–4 mm long).

Description: Chippindall 1955 (283). Voucher: Van Rooyen 3333. PRECIS code 9901751–00200.

Loudetia flavida (Stapf) C.E. Hubb.

Pointed russet grass.

Fig. 127.

Perennial; tufted; 800–1500 mm tall. Leaf blades 150–400 mm long; 2–4 mm wide. Spikelets 8–12 mm long. Leaves tend to be widely spreading; glumes acute or shortly awned, usually glabrous and rarely tubercled; lower lemma acute; female-fertile (upper) lemma lobes 1–2 mm long and acute, central awn 30–40 mm long, callus pointed or truncate; stamens 3.



Flowering November to March. Shallow rocky soils, also vleis margins. Common. Biome: Savanna and Grassland. East tropical Africa.

Description: Chippindall & Crook 1976 (93), Chippindall 1955 (282). Illustration: Chippindall 1955 (fig. 253). Voucher: Smook 912. PRECIS code 9901751–00300.

Loudetia lanata (Stent & Rattray) C.E. Hubb.

Woolly russet grass.

Perennial; tufted; 500–900 mm tall. Leaf blades 200 mm long; 4 mm wide. Spikelets 8–12 mm long. Lower leaf sheaths woolly; leaves thick with velvety white hairs; panicle open, branches purple or tinged; glumes obtuse; callus of female-fertile (upper) floret pointed, awns 40–70 mm long and purple.



Flowering January to April. Edge of vleis in sandveld areas. Common. Biome: Savanna. Angola, Zambia, Zimbabwe.

Description: Chippindall & Crook 1976 (94). Voucher: De Winter & Marais 4649. PRECIS code 9901751–00400.

Loudetia pedicellata (Stent) Chippind.

Perennial; tufted; to 1600 mm tall. Leaf blades to 150 mm long; 4–6 mm wide. Spikelets 20–28 mm long. Ligule a conspicuous fringe; spikelets in groups of 3 (or rarely paired), pedicels unequal and 2 mm and 4 mm long respectively; lower glume ovate and 1/2 the length of the upper; lower lemma 7-nerved; female-fertile (upper) lemma 9-nerved, lobes awned, 4–5 mm long, central awn 50–70 mm long.



Flowering December to April. *Burkea-Terminalia* veld. Locally common. Biome: Savanna. Domestic use (thatching), or pasture (coarse hay). This species may be confused with *Tristachya* species, which also have the spikelets in

groups of three, but in *Tristachya* the lower lemma is 3-nerved and the lower glume is acute, equal or more than 1/2 the length of the upper.

Description: Chippindall 1955 (280). Illustration: Chippindall 1955 (fig. 251). Voucher: De Winter 722. PRECIS code 9901751–00500.



Fig. 127. *Loudetia flavida*

Loudetia simplex (Nees) C.E. Hubb.

Pl. 114.

Common russet grass, stingel-gras, besemgras.

Perennial; tufted; 400–1500 mm tall. Leaf blades 100–300 mm long; 5 mm wide. Spikelets 7–13 mm long. Lower glume obtuse or truncate; female-fertile (upper) lemma lobes acute, 1 mm long, central awn 25–50 mm long, callus clearly two-toothed in mature specimens; stamens 2.

Flowering throughout the year. Poor coarse, sandy soils in open grassland or hillsides. Common (widespread). Biome: Savanna and Grassland. Tropical Africa. Domestic use (thatching and brooms). This species is exceedingly variable, especially in panicle shape, hairiness of vegetative parts and presence or absence of tubercles on the glumes and lower lemma.

Description: Chippindall & Crook 1976 (95), Chippindall 1955 (282). Illustration: Chippindall 1955 (Pl. 8). Voucher: Du Toit 2355. PRECIS code 9901751–00600.



Fig. 128. *Megaloprotachne albescens*

Megaloprotachne albescens C.E. Hubb.

Fig. 128. Pl. 115.

Erect or decumbent annual; to 800 mm tall. Leaf blades to 150 mm long; 3–4 mm wide. Spikelets 4.0–4.5 mm long. Long hairs present on the leaf sheaths and collar; lower glume as long as spikelet.

Flowering February to April. Sandveld. Infrequent. Biome: Sa-



Megaloprotachne C.E. Hubb.

Annual; caespitose, or decumbent (sometimes rooting at the lower nodes). Culms 150–900 mm high; herbaceous; branched above, or unbranched above. *Leaf blades linear*; flat. *Ligule a fringed membrane*. *Plants bisexual, with bisexual spikelets*.

Inflorescence of spike-like main branches (spike-like racemes or narrow panicles); digitate or subdigitate to non-digitate (usually subdigitate, with several racemes from below the apex); espatheate. Spikelet-bearing axes persistent.

Spikelets in pairs; consistently in 'long-and-short' combinations (but spikelets homogamous). Spikelets 4–5 mm long; abaxial; compressed dorsiventrally; falling with the glumes. *Glumes two; more or less equal*; awnless; very dissimilar (the lower hairless, the upper with four dense rows of long, green to dark purple hairs between the veins). *Proximal incomplete florets 1*; paleate, palea fully developed (two keeled); male.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; striate; becoming indurated to not becoming indurated (cartilaginous-crustaceous); hairless; having the margins lying flat and exposed on the palea; with a clear germination flap; 3 nerved (the nerves obscure); entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (almost 2 mm long); hilum short; embryo large.

Photosynthetic pathway. C₄; XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Panicoideae; Panicoideae; Paniceae. 1 species (supposedly 2). Southern tropical and South Africa. Mesophytic to xerophytic; in shade, or in open habitats (in open *Acacia* and mopane savanna); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, and Cape Province. 1 or 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Roivainen. 1974. Ann. Bot. Fennici 11: 38–42.

Species treatment by G.E. Gibbs Russell.

- 1(0). Leaf sheaths of lower leaves with long woolly hairs for some distance above the node . **M. albescens**
 Leaf sheaths of lower leaves lacking long woolly hairs except around node at base of sheath **M. glabrescens**

vanna. ?Endemic. Easily mistaken for *Digitaria*, in which the lower glume is never longer than 1/4 the spikelet length, and is often absent.

Description: Roivainen 1974 (38–40), Chippindall 1955 (422). Illustration: Chippindall 1955 (fig. 351). Voucher: Van Vuuren & Giess 1086. PRECIS code 9900881–00100.

Megaloprotachne glabrescens Roiv.

Erect or decumbent annual; to 700 mm tall. Leaf blades 60–100 mm long; 3–4 mm wide. Spikelets 3.5–4.0 mm long. Long hairs occur only on the lower parts of the leaf sheaths.

Flowering January to May. Sandveld. Conservation status not known. Biome: Savanna.

?Endemic. A less hairy variant of *M. albescens*, probably not a distinct species.

Description: Roivainen 1974 (40). Voucher: De Winter & Giess 6957. PRECIS code 9900881–00200.



Megastachya P. Beauv.

Annual (tall, erect), or perennial (weakly); decumbent (forming secondary shoots from the rooting nodes). Culms 300–1000 mm high; herbaceous; branched above. Leaf blades linear-lanceolate to lanceolate; broad; cordate (amplexicaul); flat. Ligule an unfringed membrane. The spikelets all alike in sexuality.

Inflorescence panicle; espatheate. Spikelet-bearing axes persistent.

Spikelets 7–15 mm long; compressed laterally; disarticulating above the glumes. Glumes two; very unequal; decidedly shorter than the adjacent lemmas; shortly awned (or mucronate, from the excurrent mid-nerve); similar (membranous-herbaceous, broadly ovate). Proximal incomplete florets absent.

Female-fertile florets 12–17. Lemmas incised; awnless, or mucronate (the mucro from between the lobes, via the excurrent mid-nerve); obscurely 5–7 nerved. Palea present (narrower than lemma); relatively long; 2-nerved. Stamens 2–3. Ovary glabrous. Fruit small (about 1 mm long); subglobose; hilum short; embryo small.

Transverse section of leaf blade. Mesophyll without arm cells (according to Metcalfe), or with arm cells (?); with fusoids (as represented by laterally extended PBS cells). Midrib vascularization complex (1 large median with 2 tiny laterals, all enclosed in a common sheath).

Cytology, classification, distribution. Chromosome base number, $x = 12$. Bambusoideae; Oryzodae; Centothecaeae. 1 species. Tropical and southern Africa. Mesophytic; in shade (in forests); glycophytic. Natal. 1 indigenous species.

References. 1. Clayton. 1970. FTEA.

Species treatment by G.E. Gibbs Russell.

Megastachya mucronata (Poir.) Beauv.

Weak perennial, or annual; sometimes stoloniferous; to 900 mm tall. Leaf blades 60–120 mm long; 10–25 mm wide (broadly lanceolate, base clasping, cross-veins conspicuous). Spikelets 7–15 mm long. Culms decumbent, rooting at the lower nodes; inflorescence an open panicle;

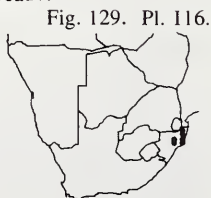


Fig. 129. Pl. 116.

spikelets long-pedicelled, with many florets.

Flowering throughout the year (usually in spring). In forests, often on sandy soil. Conservation status not known. Locally common. Biome: forest. Tropical Africa.

Description: Chippindall 1955 (45). Illustration: Chippindall 1955 (fig. 15). Voucher: Ward 8621. PRECIS code 9903881–00100.



Fig. 129. *Megastachya mucronata*

Melica L.

Beckeria Bernh., *Bromelica* (Thurber) Farw., *Claudia* Opiz, *Dalucum* Adans., *Verinea* Merino.

Perennial; long-rhizomatous. Culms 100–1500(–2000) mm high; herbaceous; unbranched above. *Sheath margins joined*. Leaf blades linear; flat, or rolled (convolute). Ligule an unfringed membrane to a fringed membrane, or a fringe of hairs (rarely).

Inflorescence a single raceme, or paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 4–20 mm long; compressed laterally to not noticeably compressed; disarticulating above the glumes, or falling with the glumes (sometimes disarticulating both above and below them). *Glumes* two; relatively large; very unequal, or more or less equal; about equalling the spikelets (usually?); *long relative to the adjacent lemmas*; awnless; *non-carinate*; very dissimilar, or similar. *Incomplete florets* distal to the female-fertile florets, merely underdeveloped, or clearly specialised and modified (*forming a ball of successively enveloped lemmas or as a swollen rachilla extension*); *proximal incomplete florets absent*.

Female-fertile florets 1–7. Lemmas similar in texture to the glumes, or decidedly firmer than the glumes (leathery); 5–9 nerved, or rarely 10–15 nerved; entire, or incised; awnless, or awned. *Awns* when present 1; from the sinus, or apical; non-geniculate; much shorter than the body of the lemma to about as long as the body of the lemma. Palea present; relatively long, or conspicuous but relatively short, or very reduced. Lodicules 2; joined; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Pooideae; Poodae; Meliceae. About 80 species. North temperate, southern Africa and South America. Mesophytic to xerophytic; in shade and in open habitats. Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. 2 indigenous species.

References. 1. Gibbs Russell & Ellis. 1982. *Bothalia* 14,1: 37–44.

Species treatment by G.E. Gibbs Russell.

- 1(0). Lemmas hairy only on margins, glabrous or slightly scabrous on back; sterile clusters glabrous or with a few hairs; spikelets 5–9(–11) mm long **M. racemosa**
 Lemmas hairy on the back and margins; sterile clusters hairy; spikelets 10–15 mm long **M. decumbens**

Melica decumbens Thunb.

(=*M. neesii* Stapf) 1.

Dronkgras.

Perennial; tufted; 300–500 mm tall. Leaf blades 20–200 mm long; 1.5–3.5 mm wide (erect, usually rolled, strongly scabrous). Spikelets 10–15 mm long.

Lemmas of female-fertile florets hairy on the back and margins; lemmas of sterile florets usually hairy.

Flowering October to April. Hillsides and mountainsides, among rocks or in the shade of trees, occasionally on roadsides. Infrequent. Biome: Grassland and Nama-Karoo. Endemic. Poisonous (to horses, cattle and donkeys).

Description: Gibbs Russell & Ellis 1982 (42), Stapf 1898–1900 (687), Chippindall 1955 (75). Illustration: Gibbs Russell & Ellis 1982 (fig. 6), Chippindall 1955 (fig. 47). Voucher: Smith 4477. PRECIS code 9903860–00300.



Fig. 130. *Melica racemosa*

Melica racemosa Thunb.

(=*M. bolusii* Stapf) 1; (= *M. brevifolia* Stapf) 1; (= *M. decumbens* sensu Gordon-Gray, non Thunb.) 1; (= *M. ovalis* Nees) 1; (= *M. pumila* Stapf) 1.

Perennial; tufted; 300–500 mm tall. Leaf blades 40–300 mm long; 1.5–5.0 mm wide (erect, flat

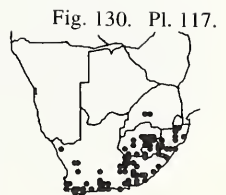


Fig. 130. Pl. 117.

or rolled, often scabrous). Spikelets 5–9(–11) mm long. Lemmas of female-fertile florets hairy only on margins; lemmas of sterile florets glabrous or with only a few hairs.

Flowering September to April. On steep hills and mountain slopes among rocks and also in lightly shaded places at edges of bushclumps and dune forest. Infrequent. Biome: Fynbos, Grassland, and Nama-Karoo. Endemic. Natal plants tend to have the larger spikelet size.

Description: Gibbs Russell & Ellis 1982 (41), Stapf 1898–1900 (687), Chippindall 1955 (74). Illustration: Gibbs Russell & Ellis 1982 (fig. 3&4), Chippindall 1955 (fig. 46). Voucher: Edwards 4179. PRECIS code 9903860–00700.

Melinis P. Beauv.

Rhynchelytrum Nees, *Suaria* Schrank, *Tristegis* Nees.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 200–1200 mm high; herbaceous; branched above, or unbranched above. *The shoots aromatic*, or not aromatic. *Leaf blades linear*; flat, or rolled. *Ligule a fringed membrane* (sometimes very narrow) to a fringe of hairs. Plants with hermaphrodite florets.

Inflorescence paniculate (often decompound, rarely composed of secund racemes); open, or contracted; espathate. *Spikelet-bearing axes persistent*.

Spikelets not in distinct 'long-and-short' combinations; 1–11 mm long; compressed laterally (often asymmetric), or compressed dorsiventrally or not noticeably compressed; disarticulating above the glumes (the fruiting floret falling first), or falling with the glumes (falling from the pedicel). Glumes one or two; very unequal; awned (G2 only, sometimes awned or mucronate or beaked upwards), or awnless; very dissimilar (G1 a scale up to 1/3 spikelet length, or reduced to a vestige or rim, G2 longer, apically emarginate or bifid, and often awned or mucronate from the sinus, firmly membranous or papery, straight or curved on the back). *Lower glume 0–1 nerved*. *Proximal incomplete florets 1*; paleate, or epaleate, palea when present fully developed to reduced; male, or sterile. *Proximal lemmas similar in texture to the female-fertile lemmas*.

Female-fertile florets 1. Lemmas less firm than the glumes, or similar in texture to the glumes (hyaline or membranous to papery); smooth (shiny); not becoming indurated; hairless (usually glabrous, rarely ciliate); having the margins lying flat and exposed on the palea; without a germination flap; 1–5 nerved; entire (truncate), or incised (emarginate or minutely two-lobed); awnless. Palea present; relatively long. Lodicules 2; fleshy or membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small, ellipsoid; hilum short; embryo large.

Photosynthetic pathway. C₄. The anatomical organization conventional. Biochemical type PCK (*M. repens*, *M. minutiflora*); XyMS+. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicodae; Paniceae (Melinideae). About 26 species. Tropical Africa, Madagascar, Arabia to Indochina, one species in tropical South America and the West Indies. Mesophytic; in open habitats (savanna and grassland, often in disturbed ground); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 10 indigenous species.

References. 1. Clayton. 1978. Kew Bull. 33. 2. Clayton & Renvoize. 1982. FTEA. 3. Zizka. 1988. Bibliotheca Botanica 138.

Species treatment by H.M. Anderson.



Fig. 131. *Melinis repens* subsp. *repens*

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 1(0). Spikelets 1.0–1.5(–2.0) mm long | 2 |
| Spikelets (2.2–)3.0–5.0(–12.0) mm long | 4 |
| 2(1). Plants not sticky; pedicels hairy below the apex, hairs few, 2–4 mm long; spikelets 1 mm long; upper glume 3–5-nerved | M. tenuissima |
| Plants sticky; pedicels not hairy below apex; spikelets 1.5–2.0 mm long; upper glume 7-nerved | 3 |

- 3(2). Plants perennial, strongly aromatic; upper glume and lower lemma grooved between the prominent nerves; upper glume may be awned, the awn 0–9 mm long ***M. minutiflora***

Plants usually annual and not aromatic; upper glume and lower lemma not grooved between the prominent nerves; upper glume not awned

..... ***M. macrochaeta***

- 4(1). Leaf sheaths strongly overlapping; leaves rolled; spikelets densely hairy; awns 1–2(–3) mm long; always perennial ***M. nerviglumis***

Leaf sheaths not strongly overlapping; leaves not rolled; spikelets glabrous or hairy; awns mainly longer than 2 mm; perennial or annual

- 5(4). Internode between the glumes 0.7–1.7 mm long; spikelets 5–12 mm long; upper glume and lower lemma always tapering into a long beak

..... ***M. repens* subsp. *grandiflora***

Internode between the glumes shorter than 0.7 mm; spikelets shorter than 5 mm; upper glume and lower lemma not tapering into a long beak

- 6(5). Awns of upper glume 5–10 mm and lower lemma 8.5–20.0 mm long

..... ***M. longiseta* subsp. *bellespicata***

Awns less than 8.5 mm long

- 7(6). Spikelets glabrous or covered with short hairs 0.5 mm long; internodes between the glumes 0.2–0.7 mm long

..... ***M. subglabra***

Rhizomes not thick and knotty, internodes between the glumes 0.4–0.7 mm long ... ***M. kallimorpha***

- 9(7). Awns of upper glume 1–6 mm and lower lemma 4.0–8.5 mm long . ***M. longiseta* subsp. *longiseta***

Awns of upper glume and lower lemma 1–3 mm long, or sometimes absent . . ***M. repens* subsp. *repens***

NOTE: *M. scabrida* is not included in the key. It is a variable grass of possible hybrid origin occurring in east Africa with only one record from the Transvaal

Melinis drakensbergensis (C.E. Hubb. & Schweick.) Clayton

(=*Rhynchelytrum drakensbergense* C.E. Hubb. & Schweick.) 1.

Zizka 1988 records that this may be a hybrid and that he was unable to find further specimens. In view of the uncertain validity of this species it is not treated here.

Description: Zizka 1988 (106). PRECIS code 9901340–00050.

Melinis kallimorpha (Clayton) Zizka

(=*Rhynchelytrum kallimorphon* Clayton) 3.

Annual; tufted; 400–1000 mm tall. Leaf blades 40–160 mm long; 2–4 mm wide. Spikelets 3.5–5.0 mm long; 1.5–2.0 mm wide. Rhizomes not thick and knotty; spikelets glabrous or with hairs 0.5 mm long; internode between glumes 0.4–0.7(–0.9) mm long; upper glume and lower lemma awned, awn 3–8 mm long, gibbous but not tapering into an elongated beak.

Flowering January to May. Sandy areas, prefers shade. Infrequent. Biome: Savanna. Angola and east Africa.



Description: Zizka 1988 (64). Illustration: Zizka 1988 (fig. 22). Voucher: Smith 4031. PRECIS code 9901340–00060.

Melinis longiseta (A. Rich.) Zizka subsp. ***bellespicata*** (Rendle) Zizka

(=*Rhynchelytrum bellespicatum* (Rendle) Stapf & C.E. Hubb.) 3.



Perennial; tufted; 200–800 mm tall. Leaf blades (30–)60–200 mm long; 1.5–5.0(–6.0) mm wide. Spikelets 3.5–5.0(–6.0) mm long; 2 mm wide. Leaves hairy or glabrous; internode between the glumes 0.3–0.5 mm long; lower glume 0.9–1.4 mm long; upper glume awned, 5–10 mm long; lower lemma awned, awn 8–20 mm long.

Flowering February to June. Crevices in rocks, usually in sunny places. Locally common. Biome: Savanna. Angola, east Africa, Cameroon, Nigeria. Distinguished from *M. longiseta* subsp. *longiseta*, which has shorter awns (4.0–8.5 mm long) and shorter internodes between the glumes (to 0.3 mm long).

Description: Zizka 1988 (78). Illustration: Zizka 1987 (fig. 31), 1 (fig. 358). Voucher: Smook 5205. PRECIS code 9901340–00070.

Melinis longiseta (A. Rich.) Zizka subsp. ***longiseta***

(=*Rhynchelytrum longisetum* (A. Rich.) Stapf & C.E. Hubb.) 3; (=*Rhynchelytrum minutiflorum* (Rendle) Stapf & C.E. Hubb. var. *melinoides* (Stent) Stapf & C.E. Hubb.) 2.



Perennial; tufted; 450–1000 mm tall. Leaf blades 40–120 mm long; 4–9 mm wide. Spikelets 2.3–3.8(–4.2) mm long; 1.5–2 mm wide. Leaves hairy, rarely glabrous; internode between the glumes rarely up to 0.3 mm long; lower glume 0.6–1.0 mm long; upper glume awned, awn 1–6 mm long; lower lemma awned, awn 4.0–8.5 mm long.

Flowering March to July. Sandy areas, open woodland. Infrequent. Biome: Savanna. Angola and east Africa to Sudan. Distinguished from *M. longiseta* subsp. *bellespicata*, which has longer awns (8–20 mm) and longer internodes between the glumes (0.3–0.5 mm).

Description: Zizka 1988 (75). Voucher: Volk 2159. PRECIS code 9901340–00080.

Melinis macrochaeta Stapf & C.E. Hubb.

Fig. 132.

Mainly annual; tufted; 500–1000 mm tall. Leaf blades 50–150 mm long; 5–10 mm wide. Spikelets 1.5–2.0 mm long; 0.5 mm wide. Culms often with stilt roots from lower nodes; lower glume reduced to a scale; upper glume 7-nerved, awnless and not grooved; female-fertile (upper) lemma with 3–5 nerves, awn (5–)8–20 mm long.

Flowering April to June. Sand or loam, mainly grassland. Infrequent. Biome: Grassland. Mainly southern tropical Africa.

Description: Zizka 1988 (106). Illustration: Chippindall 1955 (fig. 356). Voucher: Compton 27774. PRECIS code 9901340–00100.





Fig. 132. *Melinis macrochaeta*

***Melinis minutiflora* Beauv.**

(=*M. tenuinervis* (Stapf) Stapf) 2.

Molasses grass.

Perennial; tufted; 800–1500 mm tall. Leaf blades 40–200 mm long; 5–11 mm wide. Spikelets 1.5–2.0 mm long; 0.5 mm wide. Leaves strongly aromatic and sticky; hairs finely tubercled, exuding drops of viscid oil; spikelets glabrous and sometimes shortly hairy; upper glume 7-nerved, often with awn 0–9 mm long; upper glume and lower lemma grooved between the prominent veins; lower lemma awnless or awned, awns 5–14 mm long.

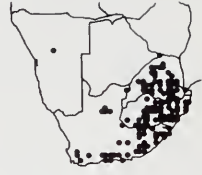
Flowering April to June. Sand or near rocks, moist and shady areas, grassland or savanna, open hillsides. Locally common. Biome: Savanna and Grassland. Cultivated throughout tropics. Cultivated pasture. The presence or absence of awns and hairiness of spikelets is rather variable.

Description: Chippindall 1955 (427). Illustration: Clayton et al. 1970–1982 (fig. 124). Voucher: Killick 1715. PRECIS code 9901340–00200.



***Melinis nerviglumis* (Franch.) Zizka**

(=*Rhynchelytrum nerviglume* (Franch.) Chiov.) 3;
(=*Rhynchelytrum nyassanum* (Mez) Stapf & C.E. Hubb.) 2;
(=*Rhynchelytrum ramosum* Stapf & C.E. Hubb.) 2;
(=*Rhynchelytrum rhodesianum* (Rendle) Stapf & C.E. Hubb.) 3;
(=*Rhynchelytrum setifolium* (Stapf) Chiov.) 2.



Perennial; tufted; (250–)400–1200(–1500) mm tall. Leaf blades (30–)100–300(–440) mm long; (1.3–)2.0–3.5(–4.5) mm wide. Spikelets (3.2–)3.6–5.0(–5.7) mm long; 2 mm wide. Basal leaf sheaths strongly overlapping; leaf blades rolled; spikelets often densely covered with hairs up to 4 mm long, white or purple; internode between glumes 0.3(–0.6) mm long; lower glume 0.5 mm long and awns 1–2(–3) mm long.

Flowering November to September. Open grassland, stony hillsides. Locally dominant. Biome: Fynbos, Savanna, and Grassland. Sub-Saharan Africa. Madagascar, possibly introduced to southeast Asia. Very similar to *M. repens* subsp. *repens*, mainly distinguished by lacking strongly overlapping leaf sheaths and rolled leaf blades.

Description: Zizka 1988 (111). Illustration: Chippindall 1955 (fig. 359). Voucher: Smook 5268. PRECIS code 9901340–00250.

***Melinis repens* (Willd.) Zizka subsp. *grandiflora* (Hochst.) Zizka**

(=*Rhynchelytrum brevipilum* (Hack.) Chiov.) 2;
(=*Rhynchelytrum costatum* Stapf & C.E. Hubb.) 2;
(=*Rhynchelytrum grandiflorum* Hochst.) 3; (= *Rhynchelytrum villosum* (Parl.) Chiov.) 2.



Annual; tufted; 250–900 mm tall. Leaf blades 40–150(–180) mm long; 2.0–6.5(–8.0) mm wide. Spikelets (4–)5–12 mm long; 2–3 mm wide. Spikelets glabrous to hairy; internode between the glumes (0.5–)0.7–1.7(–2.0) mm long; lower glume (0.6–)1.5–3.0(–4.3) mm long; upper glume and lower lemma gibbous, tapering into an elongated beak, awns (2–)12–22 mm long.

Flowering January to July. More often in sunny arid areas, not a ruderal. Locally dominant. Biome: Savanna and Nama-Karoo. Most of Africa and as far as India. Distinguished from *M. repens* subsp. *repens*, which is commonly a ruderal, and has spikelet length mostly 2–4 mm, and internode between glumes mostly 0.1–0.5(–0.6) mm long.

Description: Zizka 1988 (60). Voucher: Giess & Van der Walt 12666. PRECIS code 9901340–00275.

Melinis repens* (Willd.) Zizka subsp. *repens

(=*Rhynchelytrum repens* (Willd.) C.E. Hubb.) 3.

Natal red top.

Mainly annual, or perennial (rarely); tufted; 250–1200(–1500) mm tall. Leaf blades 40–200(–270) mm long; 2–11(–13) mm wide. Spikelets 2.2–4.0(–5.0) mm long; 2–3 mm wide. Spikelets always hairy; internode between the glumes 0.1–0.5(–0.6) mm long; lower glume (0.3–)0.6–1.3(–1.5) mm long; upper glume and lower lemma gibbous, rarely tapering into an elongated beak, mostly shortly awned, to 3 mm long.



Flowering September to May. Mainly a ruderal, common on disturbed ground. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Widely spread in tropical Africa, a common innocuous weed throughout the tropics. Erosion control, ornamental, and weed. A very variable and widely distributed species. Distinguished from *M. repens* subsp. *grandiflora* which is not usually a ruderal, and has spikelets mainly 5–12 mm long and the internode between the glumes 1.5–3.0 mm long.

Description: Zizka 1988 (57). Illustration: Chippindall 1955 (pl. 12). Voucher: Smook 4767. PRECIS code 9901340–00300.

***Melinis scabrida* (K. Schum.) Hack.**

(= *Rhynchelytrum scabridum* (K. Schum.) Chiov.) 3.

Perennial; loosely tufted; 400–1000 mm tall. Leaf blades 20–140 mm long; 2.8–6.5 mm wide. Spikelets 2.4–2.8(–3.2) mm long. Upper glume with awns to 0.3 mm long, 5–7-nerved; female-fertile (upper) lemma with awns 1.0–2.4 mm long and 5-nerved.

Open hillsides. Infrequent. Biome: Grassland. East Africa. Recorded as of possible hybrid origin by Clayton & Renvoize 1982 (511), *M. ambigua* x *M. longisetum*.

Description: Clayton et al. 1970–1982 (511). Illustration: Zizka 1988 (fig. 33). No specimens seen. PRECIS code 9901340–00325.

***Melinis subglabra* Mez**

(= *Rhynchelytrum suberostratum* Stapf & C.E. Hubb.) 2; (= *Rhynchelytrum subglabrum* (Mez) Stapf & C.E. Hubb.) 3.

Perennial; tufted; 400–1300 mm tall. Leaf blades 30–170 mm long; (2.3–)3.0–8.0(–10.0) mm wide. Spikelets 3.2–5.0 mm long; 1.5 mm wide. Rhizome thick and knotty; upper glume and lower lemma with awns up to 3 mm long.

Flowering February to June. Prefers shady areas near water. Biome: Savanna. Angola and east Africa.

Description: Clayton et al. 1970–1982 (513). Illustration: Zizka 1988 (fig. 25). Voucher: Codd 1588. PRECIS code 9901340–00350.

***Melinis tenuissima* Stapf**

Perennial; tufted; 500–1100 mm tall. Leaf blades 20–80 mm long; 3–6 mm wide. Spikelets 1.1–1.5(–1.6) mm long; 0.5 mm wide. Inflorescence open and loose, 80–200 mm long and often almost as wide; hairs 2–4 mm long on pedicel at base of spikelet; lower glume reduced to a scale 0.1 mm long; upper glume 5-nerved, awnless and not grooved; female-fertile (upper) lemma 3–5-nerved, white awn (1.5–)4.0–10.0 mm long.

Flowering April to June. Grassland and bush, often near water or in cultivation. Rare. Biome: Savanna. Tropical Africa.

Description: Chippindall 1955 (427). Illustration: Hooker's Icon pl. 2660. Voucher: Scheepers 1153. PRECIS code 9901340–00400.

***Merxmuellera* Conert**

Sometimes included in *Rytidosperma*, *Danthonia* sensu lato.

Perennial; caespitose. Culms 150–2000 mm high; herbageous; unbranched above. Leaf blades linear; 4–15 mm wide; nearly always rolled. Ligule a fringe of hairs.

Inflorescence a single raceme to 60 mm long (rarely — *M. disticha*), or paniculate; contracted (narrow, occasionally spike-like; usually longer than 60 mm, by contrast with *Karroochloa*); espatheate. Spikelet-bearing axes persistent.

Spikelets 8–25 mm long; compressed laterally; disarticulating above the glumes. Hairy callus present (0.6–2 mm, with bearded margins). Glumes two; more or less equal (G2



Fig. 133. *Merxmuellera drakensbergensis*

somewhat shorter); *about equalling the spikelets to much exceeding the spikelets*; awnless; similar (papery, margins and apex hyaline, midnerve percurrent). Incomplete florets distal to the female-fertile florets, merely underdeveloped; *proximal incomplete florets absent*.

Female-fertile florets 3–10. Lemmas similar in texture to the glumes; hairy, or hairless (rarely glabrous, the hairs when present in tufts; not in transverse rows); without a germination flap; (7–)9 nerved; incised; awned. *Awns 1, or 3*; median, or median and lateral (the lobes sometimes finely awn-tipped). The median awn different in form from the laterals (when laterals present); from the sinus (the lobes sometimes basally adherent to the median awn); geniculate; much longer than the body of the lemma. Palea present; relatively long (lanceolate); 2-nerved. Lodicules 2; membranous; ciliate (often), or glabrous. Stamens 3. Ovary glabrous. Fruit small (2–3 mm); pericarp fused.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 6$. Arundinoideae; Danthonieae. 17 species. South and southwest Africa. Mesophytic to xerophytic (often in mountains); in open habitats; glycophytic. Namibia, Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. 17 indigenous species.

References. 1. Conert. 1970. Senck. Biol. 51: 129. 2. Conert. 1971. Mitt. Bot. Stsamml. Munch. 10: 299. 3. Ellis. 1980a. Bothalia 13: 185–189. 4. Ellis. 1980b. Bothalia 13: 191–198. 5. Ellis. 1981a. Bothalia 13: 487–491. 6. Ellis. 1981b. Bothalia 13: 493–500. 7. Ellis. 1982a. Bothalia 14: 89–93. 8. Ellis. 1982b. Bothalia 14: 95–99. 9. Ellis. 1983. Bothalia 14: 197–203.

This genus is poorly known, and is in urgent need of revision. Ellis has studied the taxa anatomically and, where applicable, his observations have been noted.

Species treatment by N.P. Barker.

- 1(0). Base of plant densely woolly 2
 - Base of plant glabrous 4
- 2(1). Spikelets not densely clustered and panicle branches and pedicels are partly visible; glumes 15–22(–25) mm long, occasionally pubescent **M. decora**
 - Spikelets densely clustered such that panicle branches and pedicels are obscured; glumes 7–18 mm long, never pubescent 3
- 3(2). Glumes 3–5-nerved; lemmas 7–12 mm long, including lobes; central awn of lemmas 6–16 mm long, usually geniculate; spikelets 4–7-flowered .
..... **M. rufa**
 - Glumes 1(–3)-nerved; lemmas 6–8 mm long, including lobes; central awn of lemmas 4–8 mm long, seldom geniculate; spikelets 2–5-flowered .
..... **M. lupulina**
- 4(1). Lemma backs with hairs in obvious tufts or rows . 5
 - Lemma backs densely pubescent, hairs not in obvious tufts **M. arundinacea**
- 5(4). Lemma backs with 3 distinct tufts of long, white hairs on each side of the central nerve, rest of lemma glabrous or sparsely pubescent 6
 - Lemma backs with more than 3 or less than 3 distinct tufts of long, white hairs on each side of the central nerve, or else with a row of hairs across the lemma backs 11
- 6(5). Lemma lobes completely adnate to central awn, with no lateral bristles; central lemma awn seldom geniculate **M. macowanii**
 - Lemma lobes wholly or partly free from central awn, each lobe usually terminating into a bristle; central awn usually geniculate 7
- 7(6). Tufts of hairs on lemma backs 5–7 mm long, the most basal and marginal tuft slightly shorter, the rest of the lemma usually sparsely pubescent
..... **M. papposa**

- Tufts of hairs on lemma backs up to 3.5 mm long, the rest of the lemma glabrous 8
- 8(7). Lemmas 10–13 mm long, including lobes and bristles, lobes wholly free from the central awn; glumes 15–20 mm long, 3–5-nerved; central awn up to 15 mm long **M. aureocephala**
 - Lemmas 6.5–9.0 mm long, including the lobes and bristles, lobes partly free from central awn; glumes 9–17 mm long, 1–3-nerved; central awn 9–12 mm long 9
- 9(8). Leaf blades cylindrical with an adaxial groove and pungent apices; spikelets 2-flowered; plant up to 300 mm tall; from Namibia
..... **M. rangei**
 - Leaf blades involute or permanently infolded with hard but not pungent apices; spikelets 2–8-flowered; plant usually taller than 300 mm; not found in Namibia 10
- 10(9). Glumes 11–13 mm long, 1-nerved; remains of the dead leaves curl into a spiral at base of plant; the three tufts of hairs on each side of the central nerve on the lemma backs spaced unequally apart, the marginal tuft being positioned some distance closer to the base of the lemma than the other two more central tufts; from the northern Transvaal Drakensberg and further north
..... **M. davyi**
 - Glumes 13–17 mm long, 1–3-nerved; remains of dead leaves split, the two halves curling away from each other; the three tufts of hairs on each side of the central nerve on the lemma backs approximately equidistant from each other; mainly from the Natal Drakensberg, but also extends into the Cape and eastern Transvaal .
..... **M. drakensbergensis**
- 11(5). Lemma backs with a row of 5–7(–12) mm long, white hairs across the middle, glabrous below this **M. cincta**
 - Lemma backs with tufts of hairs and/or fringed margins, but never with a row of hairs across the middle 12
- 12(11). Lemma margins not fringed, backs with 4 or more marginal tufts of white hairs near the base, the remainder of the lemma surface glabrous or pubescent 13
 - Lemma margins with a fringe of hairs, with or without 1 tuft of white hairs on each side of the central nerve, the remainder of the lemma surface glabrous 14
- 13(12). Lemma pubescent at least down central nerve, sometimes completely pubescent basally between the tufts; glumes 9–14 mm long; spikelets 3–4(–5)-flowered . **M. guillarmodiae**
 - Lemma glabrous in centre of back between tufts; glumes 11–22 mm long; spikelets 5–7-flowered **M. stricta**
- 14(12). Lemma margins fringed with hairs 15
 - Lemma margins not fringed with hairs 16
- 15(14). Inflorescence a spike-like panicle, 20–100 mm long; spikelets distichous; lemmas with 1 basal tuft of hairs on each side of the central nerve, with a marginal fringe running from this tuft upwards **M. disticha**
 - Inflorescence a contracted, shortly branched panicle up to 180 mm long; spikelets not distichous; lemma margins fringed from base upwards, fringe ending in an apical tuft of white hairs **M. stereophylla**
- 16(14). Glumes 13–18 mm long, 3–5-nerved; spikelets 4–7-flowered; plant base not bulbous **M. dura**
 - Glumes 9–13 mm long, 1-nerved; spikelets 3(–4)-flowered; plant base bulbous
..... **M. sp. (=Ellis 5500)**

Merxmüllera arundinacea (Berg.) Conert

(=*Danthonia arundinacea*
(Berg.) Schweick.) 1.

Pl. 120.



Tall, reedlike perennial; densely tufted; 1000–1200 mm tall. Leaf blades to 600 mm long; 4–7 mm wide. Spikelets (9.0–) 13.5–16.5 mm long; 9–11 mm wide. Panicle densely contracted, 120–250 mm long; spikelets (2–)3–4-flowered; glumes 10–15 mm long, 1-nerved and usually pubescent; lemmas 6–8 mm long, including the lemma lobe which extends into a short, soft bristle; lemma back completely covered with white hairs; central awn 9–13 mm long.

Flowering August to November. Xeric areas on north facing slopes of the Cape fold mountains. Locally common (warm slopes with northern aspect). Biome: Fynbos. Endemic. Similar in habit to *Merxmüllera cincta*, which has tufted hairs on the lemma. Studied anatomically by Ellis (1982a).

Description: Stapf 1898–1900 (524), Chippindall 1955 (429). Voucher: Ellis 2474. PRECIS code 9902043–00150.

Merxmüllera aureocephala (J.G. Anders.) Conert

(=*Danthonia aureocephala*
J.G. Anders.) 1.



Perennial; densely tufted; 900 mm tall. Leaf blades 400 mm long; 1.5 mm wide. Spikelets to 23 mm long (including awns); to 10 mm wide (including awns). Panicle contracted, interrupted, to 170 mm long; spikelets 3–4-flowered; glumes 15–20 mm long, 3–5-nerved, golden-brown; lemmas 10–13 mm long, including lobes and bristles which are 5.5–7.0 mm long and free from central awn; lemma backs with 3 tufts of white hairs on either side of middle nerve, lowermost tuft marginal and somewhat distant from other 2 tufts; awn to 15 mm long, sometimes strongly geniculate.

Flowering July to August. High Drakensberg mountains in xeric areas such as steep grassy slopes above 2000 m. Locally common (Giants Castle and Cathkin Peak). Biome: Afromontane. Endemic. This species flowers in the winter months and is therefore reproductively isolated from the other alpine *Merxmüllera* species which tend to flower from August to January.

Description: Anderson 1962 Bothalia 8: 170–172. Voucher: Edwards 2453. PRECIS code 9902043–00250.

Merxmüllera cincta (Nees) Conert

(=*Danthonia cincta* Nees) 1.



Tall, reedlike perennial; densely tufted; to 2000 mm tall. Leaf blades 1000 mm long (or more); 5–15 mm wide. Spikelets to 14 mm long; to 8 mm wide. Panicle dense, contracted, 200–400 mm long; spikelets 3–4-flowered; glumes 10–13(–18) mm long, 1-nerved; lemmas 7–8 mm long, including 3.5–4.0 mm long lobes which are free from the central awn; lemma backs with a tufted row of 5–7(–12) mm long, white hairs across the middle; central awn 5–14 mm long, sometimes longer.

Flowering September to February. Moist areas such as

seeps and stream banks on the south facing mountain slopes. Locally common (in damp areas). Biome: Fynbos. Endemic. Ellis (1982a) has noted the presence of lacunae in the leaf blades of this species, an apparent adaptation to aquatic environments. There are two forms of this species. The less common form is found only in very sandy habitats and has larger floral parts (e.g. glumes 18 mm long) and very long tufts of hairs (10 mm or more) on the lemmas. The more common form has glumes 10–13 mm long and lemma hair tufts 5–7 mm long.

Description: Stapf 1898–1900 (526), Chippindall 1955 (250). Voucher: Burger 82. PRECIS code 9902043–00300.

Merxmüllera davyi (C.E. Hubb.) Conert

(=*Danthonia davyi* C.E.
Hubb.) 1.



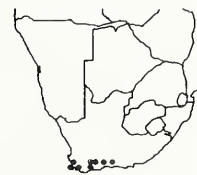
Perennial; tufted; to 1000 mm tall. Leaf blades to 600 mm long; to 1.5 mm wide. Spikelets 15–17 mm long (including awns); 6–8 mm wide (including awns). Dead leaves break off above sheath mouth and the remains curl into a tight spiral; panicle dense, 150–250 mm long; spikelets 2–4-flowered; glumes 11–13 mm long, 1-nerved; lemmas 7.5–9.0 mm long, including lemma lobes which are adnate to the central awn for 1/4–3/4 of their length, ending in a short bristle; lemma body with 3 unequally spaced tufts of white hairs on either side of central nerve, the most basal tuft being marginal and closer to the base of the lemma than the other two tufts which are equidistant, or almost so, from the lemma base; central awn 12 mm long.

Flowering September. Xeric, rocky, mountainous areas. Locally common (in the eastern Transvaal Drakensberg). Biome: Afromontane. Northwards to central Africa. This species is anatomically very similar to *Merxmüllera macowanii* (Ellis 1981b).

Description: Hubbard 1937 FTA 10: 137. Voucher: Davidson & Mogg 33315. PRECIS code 9902043–00350.

Merxmüllera decora (Nees) Conert

(=*Danthonia zeyheriana*
Steud. var. *trichostachya* Stapf)
2: (= *Danthonia zeyheriana*
Steud. var. *zeyheriana*) 2.



Perennial; tufted; 250–700 mm tall. Leaf blades to 200 mm long; to 1.5 mm wide. Spikelets 18–25 mm long; to 12 mm wide.

Culm bases bulbous, surrounded by old, woolly, persistent leaf sheaths; panicle loosely contracted, interrupted so that panicle branches are visible, 50–130 mm long; spikelets 4–7-flowered; glumes 15–22(–25) mm long, 5–7-nerved, sometimes densely pubescent; lemmas 9–15 mm long, including 5–8 mm long lobes which are adnate to the central awn for 1/3–1/2 their length, ending in a short, soft bristle; lemma backs covered from base to middle in short, dense hairs, with a row of white hairs across middle of back, glabrous above this; central awn 12–20 mm long.

Flowering August to December. Sandy soils of mountain slopes of southwestern Cape. Locally common (in naturally burnt areas and firebreaks). Biome: Fynbos. Endemic. Ellis (1983) distinguishes three anatomical forms. Variety *trichostachya* Stapf was not recognised by Conert, but it is easily distinguishable by the pubescent glumes and woolly upper sheaths.

Description: Stapf 1898–1900 (521), Chippindall 1955 (245). Illustration: Chippindall 1955 (fig. 216). Voucher: Ellis 2543. PRECIS code 9902043–00400.

Merxmuellera disticha (Nees) Conert

(=*Danthonia disticha* Nees) 1.



Perennial; tufted; 150–700 mm tall. Leaf blades 100–500 mm long; to 3.5 mm wide. Spikelets to 18 mm long (including awns); to 3 mm wide. Panicle spike-like, 20–100 mm long, with spikelets distichous, 2(–5)-flowered; glumes 9–20 mm long, 1–3-nerved; lemmas 10–15 mm long including 7–9 mm long lobes which attenuate into a long bristle; lemmas fringed along the margin with a tuft of white hairs each side near the base; central awn geniculate, 10–16 mm long.

Flowering October to May. A variety of habitats, from coastal regions to high altitude montane bogs. Common (in certain veld types such as Karroid Merxmuellera Mountain Veld). Biome: Fynbos, Grassland, Nama-Karoo, and Afro-montane. Zimbabwe. Weed (can usurp valuable grazing grasses in some areas). There are 3 anatomical forms: a 'typical form', an 'alpine bog form' and a 'Drakensberg form'. These forms may also be distinguished morphologically, as outlined by Ellis (1980a). This taxon may be confused with *Pentstemonis basutorum*, which has long, lax hairs covering the lemma.

Description: Stapf 1898–1900 (529), Chippindall 1955 (249). Illustration: Chippindall 1955 (fig. 220). Voucher: Acocks 11961. PRECIS code 9902043–00500.

Merxmuellera drakensbergensis (Schweick.) Conert

Fig. 133.

(=*Danthonia drakensbergensis* Schweick.) 1.



Perennial; tufted; to 1000 mm tall. Leaf blades to 300 mm long; to 1.3 mm wide. Spikelets 12–17 mm long (including awns); 8–13 mm wide. Old leaves break off close to the sheath mouth, and the remaining leaf bases split along the midrib, the two halves curling away from each other; panicle 80–180 mm long, loosely contracted and interrupted; spikelets (5)–6–8-flowered; glumes 13–17 mm long, 1–3-nerved; lemmas 6.5–9.0 mm long, including lobes 3.5–5.0 mm long, adnate to the central awn for approximately half their length; lemma backs with 3 tufts of equally spaced white hairs on either side of central nerve, the marginal tuft the most basal; central awn 9–12 mm long, geniculate at point where lemma lobes detach from awn.

Flowering October to March. Mesic sites in streambanks, mud patch communities and rocky outcrops of the alpine belt, in areas where the soil is deeper than in the surrounding areas. Common (streambanks and seeps). Biome: Afro-montane. Endemic. This species is anatomically very similar to *Merxmuellera stereophylla* (Ellis 1981a).

Description: Schweickert 1938 Fed. Rep. 43:88–89, Chippindall 1955 (248). Illustration: Chippindall 1955 (fig. 219). Voucher: Ellis 3304. PRECIS code 9902043–00600.

Merxmuellera dura (Stapf) Conert

(=*Danthonia dura* Stapf) 1.



Fig. 134.

Perennial; shortly rhizomatous; 600–900 mm tall. Leaf blades to 600 mm long; to 1.5 mm wide. Spikelets 20–25 mm long (including awns); 6–8 mm wide. Panicle 100–180 mm long, loosely contracted, slightly nodding; spikelets 4–7-flowered; glumes 13–18 mm long, 3–5-nerved; lemmas 7–12 mm long, including 4–7 mm long lobes terminating abruptly into a short, soft bristle; lemma



Fig. 134. *Merxmuellera dura*

back glabrous except for a marginal tuft of white hairs by the lemma base and a smaller tuft of hairs at the base of the central awn; central awn 10–15 mm long.

Flowering July to November. Stony or sandy soils in arid areas. Locally common (Carnarvon and Calvinia districts). Biome: Nama-Karoo and Succulent Karoo. Endemic. Ellis (1982b) considers this species anatomically distinct from *M. stricta*, despite some morphological similarities.

Description: Stapf 1898–1900 (527), Chippindall 1955 (248). Voucher: Ellis 2464. PRECIS code 9902043–00700.

Merxmuellera guillarmodiae Conert

Perennial; tufted; 120–400 (–700) mm tall. Leaf blades 200–400 mm long; 0.4–0.6 mm wide. Spikelets 12–15 mm long (including awns); 6–8 mm wide. Panicle 40–90 mm long, interrupted; spikelets 3–4(–5)-flowered; glumes 9–14 mm long, 3–5-nerved; lemmas 6–7 mm long including 3 mm long lobes which are adnate to the central awn for most of their length and which terminate in a short, soft bristle; lemma backs with 4 or more, sometimes indistinct, tufts of white hairs along each margin near the base, the rest of the lemma surface varying in pubescence from a quite dense, basal pubescence to almost glabrous with a few hairs each side of central nerve; central awn 5–11 mm long.



Flowering November to February. Grassland and rocky areas above about 2000 m. The alpine form is associated with moist habitats. Locally common (Drakensberg). Biome: Afro-montane. Endemic. Ellis (1980a) recognises two anatomical forms; the 'Cathkin Peak form' and the 'alpine form', which are morphologically separable: 'Alpine form' – lemmas sparsely pubescent, hairs short, awns 5.0–6.5 mm long. 'Cathkin Peak' form – lemmas densely pubescent, awn 8–11 mm long.

Description: Conert 1975 Senck. Biol. 56 (145). Illustration: Conert 1975 Senck. Biol. 56 (145). Voucher: Jacot Guillarmod 3727. PRECIS code 9902043-00750.

Merxmuellera lupulina (Thunb.) Conert

(=*Danthonia lupulina* (Thunb.) Beauv. ex Roem. & Schult.) 2.

Perennial; tufted; 400 mm tall. Leaf blades 75–150 mm long; to 3 mm wide. Spikelets 9–12 mm long; 6–8 mm wide. Culm bases bulbous, covered in old, persistent, densely woolly leaf sheaths; panicle densely contracted such that panicle branches are obscured, 20–35 mm long; spikelets 2–5-flowered; glumes 7–10 mm long, 1(–3)-nerved; lemmas 6–8 mm long, including 2.5–3.5 mm long lemma lobes adnate to the central awn for part of their length, usually ending in a short, soft bristle; lemma backs covered from base to middle by short, dense hairs, with a row of long, white hairs across the middle above which the lemma is glabrous; central awn 4–8 mm long, seldom geniculate.

Flowering October to January. Sandy mountain slopes of southwestern Cape. Locally common (in naturally burnt areas and firebreaks). Biome: Fynbos. Endemic. This species is anatomically similar to *M. rufa*, *Pentaschistis argentea* and *P. viscidula* (Ellis 1983).

Description: Stapf 1898–1900 (523), Chippindall 1955 (245). Voucher: Taylor 5477. PRECIS code 9902043-00800.

Merxmuellera macowanii (Stapf) Conert

(=*Danthonia macowanii* Stapf) 1.

Perennial; tufted; 700–1300 mm tall. Leaf blades to 650 mm long; to 1.3 mm wide. Spikelets to 13 mm long (including awns); to 6 mm wide. Old leaves break off above sheath mouth, the remaining leaf bases sometimes split along midrib and the two halves curl away from each other; panicle 170–270 mm long, loosely contracted, interrupted and shortly branched; spikelets (2–)3–4-flowered; glumes 9–14 mm long, 1–3-nerved; lemmas 10 mm long, including central awn to which lemma lobes are usually fully adnate, lateral bristles absent; lemma backs with 3 equally spaced tufts of white hairs on either side of central nerve, the tuft on the margin being most basal; central awn 5–8 mm long, seldom geniculate.

Flowering July to January. In montane and subalpine regions at altitudes between 1500 and 3000 m. Locally dominant (stream banks and marshy areas of the montane Drakensberg). Biome: Afromontane. Endemic. Domestic use (used for making brooms in Lesotho). Anatomically very similar to *M. aureocephala* and *M. davyi*, with which this species is closely allied and not consistently separable (Ellis 1981b).

Description: Stapf 1898–1900 (527), Chippindall 1955 (248). Voucher: Ellis 3282. PRECIS code 9902043-00900.

Merxmuellera papposa (Nees) Conert

(=*Danthonia papposa* Nees) 1.

Perennial; tufted; to 500 mm tall. Leaf blades 120–300 mm long. Spikelets 20–25 mm long (including awns); 5–7 mm wide (excluding awns). Panicle 120–150 mm long, dense; spikelets 2–3-flowered; glumes 13–18 mm long, 3-nerved; lemmas

9–10 mm long including 5 mm long lobes which are free from the central awn; backs of lemmas with 3 tufts of long (5–7 mm) white hairs on each side of the central nerve, the most basal being shorter, marginal and situated some distance from the other two more apical tufts, with the rest of the lemma surface below these tufts being sparsely pubescent; central awn 15–18 mm long, geniculate.

Flowering December and January. Infrequent (known from only a few fragments at PRE, all apparently from the Uitenhage area). Biome: Fynbos. Endemic. Despite the poor quality of specimens seen, the very long tufts of hairs on the lemmas distinguish this species from other merxmuelleras.

Description: Stapf 1898–1900 (527). Voucher: No voucher given as there is no proper material. PRECIS code 9902043-01000.

Merxmuellera rangei (Pilg.) Conert

(=*Danthonia rangei* Pilg.) 1.

Perennial; tufted; 120–300 mm tall. Leaf blades 35–140 mm long; to 1.3 mm wide. Spikelets 11–14 mm long (including awns); to 2 mm wide. Upper 2 nodes of culm often conspicuously dark brown or black; basal sheaths persistent and papery; leaf blades cylindrical with small adaxial groove, pungent; panicle 40–60 mm long, contracted and partially enclosed by uppermost sheath; spikelets 2-flowered; glumes 9–12 mm long, 1–3-nerved; lemmas 7 mm long including 4 mm long lobes; lemma backs with 3 tufts of white hairs on either side of the central nerve; central awn geniculate, 9–10 mm long.

Flowering August to October. Dry, sandy areas between hills and koppies. Conservation status not known. Biome: Nama-Karoo. Endemic. Natural pasture (for sheep and goats). Ellis (1982b) postulates that this species has an affinity with *Dregeochloa*.

Description: Pilger 1909 Bot. Jb. 43: (386), Launert 1970 (160:128). Voucher: De Winter & Giess 6323. PRECIS code 9902043-01100.

Merxmuellera rufa (Nees) Conert

(=*Danthonia lanata* (Schrad.)

Schrad. var. *lanata*) 2;

(=*Danthonia lanata* (Schrad.)

Schrad. var. *maior* Nees) 2;

(=*Danthonia macrocephala* Stapf) 2.

Perennial; tufted; to 400 mm tall. Leaf blades to 200 mm long; to 4.5 mm wide. Spikelets to 25 mm long (including awns); to 15 mm wide. Base bulbous, covered in old, persistent, woolly sheaths; panicle 30–70 mm long, globose or cylindrical, with spikelets densely clustered; spikelets 4–7-flowered; glumes 10–18 mm long, 3–5-nerved; lemmas 7–12 mm long, including 3.0–6.5 mm long lobes which are adnate to the central awn for part of their length and usually end in a short, soft bristle; lemma backs shortly and densely pubescent from base to middle region, with row of white hairs across the middle above which the lemma is glabrous; central awn 6–16 mm long, geniculate.

Flowering September to December. Sandy soils on mountain slopes in southern and southwestern Cape. Locally common (in naturally burnt areas and fire breaks). Biome: Fynbos. Endemic. Ellis (1983) described three anatomical forms of this species, one of which is actually a variety of *M. decora*. The two remaining forms which constitute *M. rufa* are morphologically distinguishable, and account for the wide range of variation in this taxon. The first form has shorter glumes (10–12 mm) with 3 indistinct nerves near the base, and a central lemma awn 6–9 mm long. The second form is larger, with glumes 16–18 mm



long, 3–5 obvious basal nerves, and a central lemma awn 11–16 mm long. Both forms are anatomically similar to *M. lupulina*.

Description: Stapf 1898–1900 (522), Chippindall 1955 (244). Voucher: Ellis 2517. PRECIS code 9902043–01200.

***Merxmuellera stereophylla* (J.G. Anders.) Conert**

(=*Danthonia stereophylla* J.G. Anders.) 1.



Perennial; tufted; 800 mm tall. Leaf blades to 360 mm long; to 1.5 mm wide. Leaves rigid, erect; panicle contracted, shortly branched, to 180 mm long; spikelets (3–)4–5-flowered; glumes 11–18 mm long, 1-nerved; lemmas 10–16 mm long, including 5–7 mm long lobes which are free from central awn; lemma backs glabrous with only the margins fringed with short hairs from base to middle, this fringe terminating in a marginal tuft of white hairs; central awn 13–18 mm long, geniculate close to the base, twisted basally, the apical portion much longer than base and protruding from spikelets for some length.

Flowering December to April. Xeric alpine grasslands and crevices in basaltic cliffs of the Drakensberg above 2000 m. Common (in alpine grassland). Biome: Afromontane. Endemic. Anatomically and morphologically very similar to *M. drakensbergensis* (Ellis 1981a), which has smaller floral parts (especially awns), usually more florets and a different pattern of hair tufts on the back of the lemmas.

Description: Anderson 1960 *Bothalia* 7: (419). Voucher: Killick 2349. PRECIS code 9902043–01300.

***Merxmuellera stricta* (Schr.) Conert**

(=*Danthonia stricta* Schr.) 1.



Pl. 121.

Perennial; tufted; 300–800 mm tall. Leaf blades 100–450 mm long; to 0.5 mm wide. Spikelets to 23 mm long (including awns); to 10 mm wide. Panicle loosely contracted, interrupted, 30–130 mm long; spikelets 5–7-flowered; glumes 11–22 mm long, 3–7-nerved; lemmas 6–9 mm long, including 3.5–5.5 mm long lobes which terminate in a short, soft bristle; lemma backs with 4, sometimes more, occasionally indistinct tufts of white hairs along each margin near the base; central awn 6–12(–17) mm long.

Flowering August to March. A variety of habitats. Common (in Fynbos and Renosterbosveld veld types). Biome: Fynbos, Nama-Karoo, and Afromontane. Endemic. This taxon consists of two anatomical forms (Ellis 1980a). The 'Drakensberg form' has dense tufts of long hairs (to 3.5 mm) on the lemmas and longer glumes (15–22 mm) which are often partially dark brown. The 'typical form' occurring from Cape Town to the eastern Cape, has tufts of shorter hairs on the lemmas, shorter glumes (11–16 mm) which are straw-coloured. The Drakensberg form also appears to flower later, from December to January.

Description: Stapf 1898–1900 (528), Chippindall 1955 (247). Voucher: Ellis 2242. PRECIS code 9902043–01400.

***Merxmuellera* sp. (= Ellis 5500)**

Perennial; shortly rhizomatous; 730–1000 mm tall. Leaf blades to 150 mm long; about 1 mm wide. Spikelets 12–15 mm long (excluding awns); 4–6 mm wide (excluding awns). Culm bases bulbous, glabrous, straw-coloured; leaf blades basal, short and pungent; panicle contracted,



shortly branched, to 150 mm long; spikelets 3(–4)-flowered; glumes 9–13 mm long, 1-nerved; lemmas 8.5–11.0 mm long including 5–7 mm long lobes attenuating into a long (to 5 mm) bristle; lemma backs glabrous except for one tuft of white hairs on each margin halfway up lemma body; central awn 11–15 mm long, geniculate near base. Flowering November. Seeps and streambanks. Rare. Biome: Fynbos. Endemic. Ellis (pers. comm.) considers this species to be anatomically similar to *M. decora*.

Voucher: Ellis 5500. PRECIS code 9902043–99999.

***Microchloa* R.Br.**

Micropogon Pfeiffer.

Annual (rarely), or perennial; caespitose (low), or decumbent (mat-forming). Culms 50–600 mm high; herbaceous; unbranched above. *Ligule a fringed membrane (narrow), or a fringe of hairs.*

Inflorescence a single spike (slender, often curved); espatheate (but often embraced by the uppermost sheath). Spikelet-bearing axes persistent (tough, narrow).

Spikelets solitary; biseriate; 1.7–5.5 mm long; compressed dorsiventrally; disarticulating above the glumes. Glumes two; more or less equal; long relative to the adjacent lemmas (exceeding the floret); awnless; very dissimilar



Fig. 135. *Microchloa caffra*

(the lower asymmetric, cymbiform, keeled, twisted at the base; the upper flat). All florets female-fertile; *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas without a germination flap; 2 *nerved*; entire, or incised; awnless; or mucronate. Palea present. Lodicules 2; fleshy; glabrous. Stamens 3 (anthers relatively long). Ovary glabrous. Fruit small (0.9–1.5 mm); ellipsoid; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C_4 ; XyMS+. PCR sheath outlines uneven, or even. PCR sheath extensions absent. PCR cell chloroplasts centrifugal/peripheral (usually), or centripetal (in some individuals of *M. caffra*?).

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 4 species. 3 in Africa, 1 pantropical. Mesophytic to xerophytic; in open habitats (savanna, in shallow hard soils); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 3 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Plants annual, loosely tufted; leaves usually cauline, old leaf sheaths not breaking into fibres; anthers 0.3–0.7 mm long ***M. indica***
Plants perennial, densely tufted; leaves usually basal, old leaf sheaths splitting into a tuft of dense fibres; anthers 0.5–2.0 mm long 2
2(1). Spikelets 2.5–4.0 mm long; anthers 0.5–1.2 mm long; spikes rarely more than 1 mm wide .. ***M. kunthii***
Spikelets 3.0–5.5 mm long; anthers 1.2–2.0 mm long; spikes 1–2 mm wide ***M. caffra***

***Microchloa caffra* Nees**

Elsgras, pincushion grass.

Perennial; densely tufted (with most leaves basal); 100–500 mm tall. Leaf blades 20–100 mm long. Spikelets 3.0–5.5 mm long. Old leaf sheaths splitting into fibres; spike 40–150 mm long; 1–2 mm wide; anthers 1.2–2.0 mm long; caryopsis terete, over 1 mm long.

Flowering October to April. Shallow soils on rocky outcrops. Common. Biome: Savanna, Grassland, and Nama-Karoo. Africa south of the equator. The circumscription of this species is not clear-cut. It intergrades with *M. kunthii*, which generally has shorter spikelets and anthers.

Description: Hitchcock & Chase 1950 (636), Chippindall 1955 (203), Clayton et al. 1970–1982 (316). Illustration: Chippindall 1955 (fig. 179). Voucher: Smook 4450. PRECIS code 9902940–00100.

***Microchloa indica* (L. f.) Beauv.**

(=*M. setacea* R. Br.) 1.

Annual; loosely tufted (with leaves usually cauline); 90–200 mm tall. Leaf blades 10–80 mm long; 0.3–1.8 mm wide. Spikelets 1.7–2.9 mm long. Old leaf sheaths not splitting into fibres; anthers 0.3–0.7 mm long; caryopsis dorsally compressed, 1 mm long.

Fig. 135. Pl. 122.



Flowering January to May. In semi-shade on bare hard ground. Rare (in South Africa). Biome: Savanna. Africa south of the Sahara and Mexico. Very similar to *M. kunthii* in all characters except its annual habit.

Description: Stapf 1898–1900 (636), Chippindall 1955 (204), Clayton et al. 1970–1982 (314). Voucher: Volk 1013. PRECIS code 9902940–00200.

***Microchloa kunthii* Desv.**

Elsgras, pincushion grass.

Perennial (growing in compact mats); densely tufted (with most leaves basal); 100–430 mm tall. Leaf blades 10–80 mm long. Spikelets 2.5–4.0 mm long. Basal sheaths splitting into fibres; spikes 20–150(–250) mm long; rarely more than 1 mm wide; anthers 0.5–1.2 mm long; caryopsis 1.5 mm long.

Flowering November to April. Shallow soil on rocky outcrops, open sandy patches or sometimes even on waterlogged, clayey soil. Infrequent. Biome: Savanna and Grassland. Africa south of the Sahara. Intergrades with *M. caffra*, which generally has longer spikelets and anthers.

Description: Clayton et al. 1970–1982 (314). Illustration: Clayton et al. 1970–1982 (fig. 88). Voucher: De Winter & Codd 557. PRECIS code 9902940–00300.



***Microlaena* R.Br.**

Sometimes included in *Ehrharta*.

Perennial; long-stoloniferous and caespitose. Culms 300–2000 mm high; woody and persistent, or herbaceous. Leaf blades linear to linear-lanceolate; flat (or concave). *Ligule an unfringed membrane to a fringed membrane (a hyaline rim, with caducous cilia)*. Plants bisexual, with bisexual spikelets. *The spikelets all alike in sexuality (but often cleistogamous, leading to reduced paleas and lodicules, and indehiscent stamens)*.

Inflorescence a single raceme, or panicle; espatheate. Spikelet-bearing axes persistent.

Spikelets compressed laterally; disarticulating above the glumes; with a distinctly elongated rachilla internode above the glumes (i.e., beneath the empty lemmas). Hairy callus present. Glumes two; minute; very unequal (G2 longer); decidedly shorter than the adjacent lemmas; awnless; similar (membranous). Proximal incomplete florets 2 (similar); epaleate; sterile. The proximal lemmas awned (long acuminate, tapered into long slender awns).

Female-fertile florets 1. Lemmas 5–7 *nerved*; entire; awnless, or mucronate, or awned (tapered into the stout awn). Awns 1; median. Awns apical; non-geniculate; much shorter than the body of the lemma. Palea present (usually); when present relatively long, or conspicuous but relatively short, or very reduced; 1-*nerved* (or nerveless). Lodicules 2; membranous; glabrous. Stamens 2–6. Ovary glabrous. Fruit medium sized; oblong-linear; hilum long-linear; embryo small.

Transverse section of leaf blade. Mesophyll without arm cells; without fusoids. Midrib with one bundle only.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Bambusoideae; Oryzodae; Ehrharteae. 10 species. Philippines, Java to Australasia. Helophytic to mesophytic; in shade and in open habitats. Natal. 1 naturalized species.

References. 1. Willemse, L.P.M. 1982. Blumea 28: 181–194.

Species treatment by G.E. Gibbs Russell.

Microlaena stipoides (Labill.) R. Br.

Pl. 123. Pl. 124.

Slender perennial; weakly tufted; 300–500 mm tall. Leaf blades 40–150 mm long; 1.5–3.0 mm wide. Spikelets 20–30 mm long (including stipe and awn). Sterile lemmas subtended by a long stipe with a fine tuft of hairs at its base, lemma tips drawn out into a long scabrous awn; stamens usually 4.



Semi-shade in forests. Rare. Naturalized from Australasia. Malesia, New Zealand and Australia. Recently *Microlaena* has been united with *Ehrharta* (Willemse 1982), on the grounds that the characters supporting four genera in Ehrharteae are too variable within the genera to be used for generic differences.

Voucher: Gordon-Gray s.n. PRECIS code 9901610–00300.

Microstegium Nees

Coelarthron Hook.f., *Ephebopogon* Steud., *Leptatherum* Nees, *Nemastachys* Steud., *Psilopogon* Hochst.

Annual, or perennial (rambling); decumbent. Culms 300–600 mm high; herbaceous; unbranched above. Leaf blades linear to lanceolate; flat. *Ligule an unfripped membrane*. Plants bisexual, with bisexual spikelets. The spikelets homomorphic.

Inflorescence of spike-like main branches (flexuous, fragile racemes, these not villous); digitate or subdigitate (usually digitate), or non-digitate (sometimes scattered on a short axis); spatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes with very slender rachides; disarticulating at the joints.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets hermaphrodite. Female-fertile spikelets compressed dorsiventrally; falling with the glumes (the pedicellate spikelet falling from its pedicel, the sessile falling with the adjacent internode and pedicel). Glumes two; more or less equal; awned, or awnless; very dissimilar (lower bicarinate, channelled; upper laterally compressed, naviculate). *Lower glume sulcate on the back*. Proximal incomplete florets 1 (often very reduced); epaleate, or paleate, palea reduced; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline or membranous); incised; awned. Awns 1; median; from the sinus (usually); geniculate; much longer than the body of the lemma. Palea present, or absent; relatively long (always small, but sometimes exceeding the body of the L2), or conspicuous but relatively short to very reduced. Lodicules 2; fleshy; glabrous. Stamens 2–3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. About 15 species. Tropical and subtropical Africa and Asia. Mesophytic; in shade; glycophytic. Transvaal, Natal, and Cape Province. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.



Fig. 136. *Microstegium nudum*

Microstegium nudum (Trin.) A. Camus

(=*M. capense* (Hochst.) A. Camus) 1.

Fig. 136. Pl. 125.



Trailing annual (forming tangled mats); to 600 mm tall. Leaf blades to 80 mm long; 2–7 mm wide. Spikelets 3.5–4.5 mm long (sessile and pedicellate alike). Inflorescence of 3–4 slender racemes, solitary or paired on central axis; lower glume of sessile spikelets concave on back.

Flowering January to May. Moist shady places in forests. Infrequent. Biome: Forest. Tropical Africa east to Japan and Australia.

Description: Chippindall 1955 (484), Clayton et al. 1970–1982 (717). Illustration: Chippindall 1955 (fig. 396). Voucher: Fisher 131. PRECIS code 9900550–00100.

Miscanthus Anderss.

Sometimes included in *Miscanthidium* Stapf.

Perennial; sometimes long-rhizomatous. Culms 1000–4000 mm high; herbaceous (erect); unbranched above. Leaf blades linear; flat (or terete). Ligule an unfriable membrane. Plants bisexual, with bisexual spikelets. The spikelets homomorphic.

Inflorescence of spike-like main branches, or paniculate (the panicle often large, branched, silky, red or brown: the central axis longer and the racemes shorter in the species previously assigned to *Miscanthidium*); open, or contracted; espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (slender, flexuous); with very slender rachides; disarticulating at the joints (but tardily).

Spikelets in pairs; consistently in 'long-and-short' combinations; unequally pedicellate in each combination. Pedicels free of the rachis. The short-pedicellate spikelets hermaphrodite. The long-pedicellate spikelets hermaphrodite. Female-fertile spikelets compressed dorsiventrally; falling with the glumes (disarticulating from the pedicels before break-up of the rachis). Glumes two; more or less equal; awnless; very dissimilar (papery to leathery: G1 flat-backed, 2-keeled with inflexed margins and nerves between the keels, G2 naviculate). Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire (seemingly); awned. Awns 1; median; apical; geniculate (twisted, slightly bent); about as long as the body of the lemma to much longer than the body of the lemma. Lemmas hairy (marginally). Palea present (but small); conspicuous but relatively short. Lodicules 2; fleshy. Stamens 3. Hilum short; embryo large.



Fig. 137. *Miscanthus capensis*

Cytology, classification, distribution. Chromosome base number, $x = 15$. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 6–7 species. Tropical and southern Africa. Helophytic; in shade, or in open habitats (streamsides and forest margins); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 2 indigenous species.

Intergeneric hybrids procured with *Saccharum*.

References. 1. Launert. 1970. FSWA. 2. Clayton & Renvoize. 1982. FTEA. 3. PRE Herbarium practice, following Gibbs Russell.

Species treatment by G.E. Gibbs Russell.

1(0). Leaf blades terete, reduced to a midrib. **M. junceus**

Leaf blades expanded, sometimes folded or sometimes narrowed to the midrib near base . . .

M. capensis

Miscanthus capensis (Nees) Anderss.

Fig. 137. Pl. 126.

(=*Miscanthidium capense* (Nees) Stapf var. *capense*) 2; (= *Miscanthidium capense* (Nees) Stapf var. *villosa* Stapf) 3; (= *Miscanthidium sorghum* (Nees) Stapf) 3; (= *Miscanthidium erectum* Stent & C.E. Hubb.) 3.



Ruigtegras, dabagrass.

Perennial (often robust); tufted; to 2400 mm tall. Leaf blades to 90 mm long; to 16 mm wide (expanded). Spikelets 4–6 mm long.

Flowering November to April. Riverbanks, forest margins and wet places. Infrequent. Biome: Fynbos, Savanna, and Grassland. Southern Africa. All three broad-leaved species formerly recognized in *Miscanthidium*, *M. sorghum*, *M. erectum* and *M. capense*, are combined here because of great variability in the characters upon which separation has been attempted, including leaf blade reduction, leaf blade hairiness, ligule length, and spikelet length and hairiness. In addition, these characters apparently do not correlate with major habitat differences between streamsides and forest margins.

Description: Chippindall 1955 (478). Illustration: Chippindall 1955 (fig. 393). Voucher: Moll 1667. PRECIS code 9900380–00100.

Miscanthus junceus (Stapf) Pilg.

(=*Miscanthidium junceum* Stapf) 3; (= *Miscanthidium teretifolium* (Stapf) Stapf) 1, 2.

Besemgras, ruigtegras.

Perennial; tufted; 1000–1800 mm tall. Leaf blades 500–1000 mm long; to 3 mm wide (terete). Spikelets 4–5 mm long.

Flowering November to June. Riverbanks and vleis. Infrequent. Biome: Savanna and Grassland. Southern tropical Africa.

Description: Chippindall 1955 (480). Voucher: Edwards 2053. PRECIS code 9900380–00500.



Monelytrum Hack.

Annual, or perennial; long-stoloniferous (each 'stolon' being a single, bare internode), or caespitose, or decumbent. Culms 80–800 mm high; herbaceous; branched above, or unbranched above. *Leaf blades* 2–7 mm wide (their margins thickened, with tubercle-based hairs); somewhat *cordate*; flat, or rolled (convolute). Ligule a fringed membrane. The spikelets of sexually distinct forms on the same plant (there being 1–3 sterile spikelets at the tips of the reduced inflorescence branches).

Inflorescence bristly, a false spike, with clusters of spikelets on reduced axes; spatheate. Spikelet-bearing axes disarticulating; falling entire (i.e., the clusters shed).

Female-fertile spikelets solitary; 3–4 mm long; compressed dorsiventrally; falling with the glumes (with the glomerules). *Hairy callus present (at base of cluster)*. Glumes one per spikelet (G1 sometimes absent), or two; relatively large (G2); very unequal; long relative to the adjacent lemmas (i.e., G2); awned (G2 with an awn at least as long as itself); very dissimilar (G1 reduced to a minute scale, G2 flat, elliptic-lanceolate, herbaceous). All florets female-fertile; *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas less firm than the glumes (membranous); without a germination flap; 3 nerved; entire to incised; mucronate to awned (from the mid-nerve). Awns when present 1; median; apical; non-geniculate; much shorter than the body of the lemma. Palea present (broadly lanceolate); relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (2 mm long); ellipsoid; hilum short (the hilum elliptical); pericarp fused; embryo large (about 1/3 the length of the fruit).

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 2 species. Southwest Africa to southern Angola. Xerophytic; in open habitats (in seasonally moist locations?); glycophytic. Namibia. 1 indigenous species.

References. 1. Launert. 1970. FSWA.

Species treatment by G.E. Gibbs Russell.

Monelytrum luederitzianum Hack.

(= *M. annuum* Goossens) 1.

Perennial, or annual; stoloniferous, or tufted; to 800 mm tall. Leaf blades to 500 mm long; to 8 mm wide. Spikelets 3–4 mm long. Pedicels and spikelet bases woolly; upper glume and lemma awned; bisexual floret one.

Flowering December to June. Rocky hillslopes and often by ephemeral water on sandy or calcareous soils. Infrequent. Biome: Savanna and Nama-Karoo. Into southern Angola.

Description: Chippindall 1955 (110). Illustration: Chippindall 1955 (fig. 83). Voucher: De Winter 2558. PRECIS code 9902750-00200.

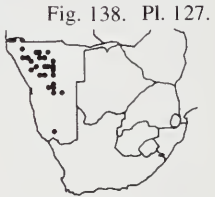


Fig. 138. Pl. 127.



Fig. 138. *Monelytrum luederitzianum*

Monocymbium Stapf

Perennial; caespitose. Culms 300–1200 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat (tapering to a sharp point). Ligule an unfringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (the pedicellate spikelets awnless); all in heterogamous combinations.

Inflorescence paniculate (the 'racemes' loosely gathered into a false panicle); spatheate; a complex of 'partial inflorescences' and intervening foliar organs. Spikelet-bearing axes 'racemes' (with at least 6 spikelet pairs); solitary; with very slender rachides (filiform); disarticulating at the joints.

Spikelets in pairs; consistently in 'long-and-short' combinations: these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only, similar in form to the sessile, except that they are awnless. Female-fertile spikelets compressed dorsiventrally (flattened dorsally, the sides rounded); falling with the glumes (deciduous with the adjacent joint and pedicel). Glumes two; more or less equal; awned (G2 from a notch); very dissimilar (thinly cartilaginous; G2 awned). *Lower glume not two-keeled (naviculate, laterally compressed and keeled over upper 1/3)*. *Proximal incomplete florets 1*; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (except for the cartilaginous median zone); incised; awned. Awns 1; median; from the sinus; geniculate; much longer than the body of the lemma. Palea absent. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$, or 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 4 species. Tropical and southern Africa. Mesophytic; in open habitats (savanna); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.

Fig. 139. *Monocymbium cerasiiforme*

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell & M. Koekemoer.

Monocymbium cerasiiforme (Nees) Stapf

Fig. 139. Pl. 128.

Wild oatgrass, wildehewergras.

Graceful perennial; sometimes shortly rhizomatous and tufted (loosely or densely); 300–1000 mm tall. Leaf blades 50–180 mm long; 2–6 mm wide. Spikelets (sessile and pedicellate) 3.5–4.0 mm long. Plant reddish or purple-tinged when flowering; racemes solitary, partly enclosed in the reddish-brown boat-shaped spatheole.

Flowering January to June. Open grassland and hillsides, often in wet places. Common. Biome: Savanna and Grassland. Tropical Africa. Indicator (acid soils). Some *Hyparrhenia* species have similar ovate reddish spatheoles, but they all are larger plants and have paired racemes. *Schizachyrium* spp. and *Andropogon fastigiatus* also have solitary spatheate racemes, but in *Schizachyrium* the spatheoles are narrow, and *A. fastigiatus* is annual.

Description: Chippindall 1955 (515), Clayton et al. 1970–1982 (825). Illustration: Chippindall 1955 (fig. 411), Clayton et al. 1970–1982 (fig. 190). Voucher: Ward 6477. PRECIS code 9900750–00100.

Mosdenia Stent

Perennial; long-stoloniferous (the stolons with densely imbricate cataphylls). Culms 100–900 mm high; herbaceous; unbranched above. Leaf blades linear to linear-lanceolate. Ligule an unfringed membrane (laciniate). The spikelets of sexually distinct forms on the same plant (those at the tip of the inflorescence sometimes reduced), or all alike in sexuality.

Inflorescence a single spike (dense, continuous, elongated, the spikelets spreading at right angles to the axis); espatheate. Spikelet-bearing axes persistent.

Fig. 140. *Mosdenia leptostachys*

Female-fertile spikelets solitary; *not two-ranked* (in whorls or spirals); not in distinct 'long-and-short' combinations; 2.5–3.75 mm long (sub-falcate); falling with the glumes. *Glumes* two; more or less equal (G1 slightly longer and broader); about equalling the spikelets (or somewhat longer); *awnless*; very dissimilar (G2 flat-backed). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas less firm than the glumes; without a germination flap; 1 nerved, or 3 nerved; entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (about 1.5 mm long); ellipsoid; hilum short (this elliptical); pericarp fused; embryo large (about 1/3 the length of the fruit).

Photosynthetic pathway and related features. C₄; XyMS+. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 1 species. South Africa. Mesophytic; in open habitats (dry savanna); glycophytic. Transvaal. 1 indigenous species.

References. 1. Clayton. 1971. Kew Bull. 25: 250.

Species treatment by G.E. Gibbs Russell.

Mosdenia leptostachys (Fical. & Hiern) Clayton

Fig. 140. Pl. 129.

(=*M. phleoides* (Hack.)

Stent) 1.

Perennial; rhizomatous (rhizome creeping); to 900 mm tall. Leaf blades 20–80 mm long; 2–3 mm wide. Spikelets 2.50–3.75 mm long. Inflorescence narrowly spikelike; spikelets awnless, not clustered; glumes glabrous, 1-nerved; bisexual floret one.

Flowering January to April. Bushveld, usually on sandy soil. Infrequent. Biome: Savanna. Endemic.

Description: Chippindall 1955 (108). Illustration: Chippindall 1955 (fig. 81). Voucher: Codd 825. PRECIS code 9902741–00100.



Nassella Desv.

Sometimes included in *Stipa* p.p.

Perennial; caespitose. Culms 250–650 mm high; herbaceous. *Ligule* an *unfringed membrane*.

Inflorescence panicleate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets 1–3 mm long; compressed laterally (but plump and *gibbous*); disarticulating above the glumes. Glumes two; more or less equal; much exceeding the spikelets; awned (acuminate into an awn), or awnless; similar. All florets female-fertile; *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas saccate (above); decidedly firmer than the glumes; hairy, or hairless; without a germination flap; 3 nerved (obscurly); entire; awned. *Awns* 1; *located asymmetrically*; dorsal; geniculate; much longer than the body of the lemma. Palea present; conspicuous but relatively short; nerveless. Lodicules 2 (in material seen); fleshy ('stipoid'); glabrous. Stamens 3. Ovary glabrous. Fruit small; oblong to pyriform; hilum long-linear; pericarp fused; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Arundinoideae; Stipeae. 15 species. Andes. Mesophytic to xerophytic; in open habitats; glycophytic. Cape Province. 1 naturalized species.

References. 1. Caro. 1966. Kurtziana. 3: 79.2. Clayton & Renvoize. 1986. Gen. Gram.

Species treatment by G.E. Gibbs Russell.

Nassella trichotoma (Nees) Hack. ex Arech.

(=*Stipa trichotoma* Nees) 2.

Fig. 141. Pl. 130.

Nassella tussock, serrated tussock.

Perennial; densely tufted; 250–650 mm tall. Leaf blades 150–450 mm long; 0.25–0.50 mm wide (setaceous). Spikelets 6.0–



Fig. 141. *Nassella trichotoma*

8.5 mm long (excluding awns to 35 mm long). Glumes swollen around floret at base; floret asymmetrical, upper end rounded, awn not centrally placed.

Flowering August to January. Mountain grasslands and disturbed places. Locally dominant. Naturalized and invader (very serious) from South America. Southern hemisphere. Declared weed. This species is sometimes classified in *Stipa* and is very similar vegetatively to *S. tenuissima* but is distinguished by its asymmetric floret with the awn arising from one side.

Description: Wells 1986 Mem. Bot. Surv. S. Afr. (53:502). Illustration: Henderson & Anderson Mem. Bot. Surv. S. Afr. (37:40). Voucher: Theron 1856. PRECIS code 9902650-00100.

Odontelytrum Hack.

Perennial; long-stoloniferous. Culms 600–1000 mm high (standing 300–400 mm above the water); herbaceous; branched above. Leaf blades linear, or linear-lanceolate; flat, or rolled. Ligule an unfringed membrane to a fringed membrane. The spikelets all alike in sexuality.

Inflorescence a false spike, with clusters of spikelets on reduced axes, or a single raceme (a coarse, cylindrical 'raceme', apparently representing a raceme of reduced 'glomerules', each glomerule shortly pedunculate, comprising a single spikelet subtended by a lobed scale forming an involucre-plus-bristle); espatheate (but enveloped below by the uppermost leaf sheath, whose blade is at least as long as the inflorescence). Spikelet-bearing axes disarticulating; falling entire (i.e., the reduced 'glomerules' deciduous — the main axis persistent).

Spikelets associated with bractiform involucre (at least some of them) subtended by solitary 'bristles' (each spikelet with a purplish, irregularly 4–6 lobed involucre,

this being herbaceous except for one lobe, which is almost free, awnlike, scabrid and 12–25 mm long); solitary. Spikelets 10–14 mm long; abaxial; compressed dorsiventrally; falling with the glumes. Glumes one per spikelet (G1 missing), or two; very unequal (G1 when present very small); awnless. Proximal incomplete florets 1; paleate, palea fully developed (as long as the lemma); male.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (cartilaginous below, herbaceous above); smooth; not becoming indurated; hairless; having the margins lying flat and exposed on the palea; without a germination flap; 7 nerved; entire; awnless (the tip caudate, membranous). Palea present; relatively long (equalling the lemma). Stamens 3. Embryo large (about 1/3 the length of the fruit).

Photosynthetic pathway. C₄; XyMS+. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Panicoideae; Panicoideae; Paniceae. 1 species (*O. abyssinicum*). Abyssinia and southern Africa. Helophytic (in flowing or standing water); in open habitats; glycophytic. Transvaal and Orange Free State. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by H.M. Anderson.

Odontelytrum abyssinicum Hack.

Fig. 142. Pl. 131.

Perennial; hydrophyte; 600–1000 mm tall. Leaf blades 100–200 mm long; 7 mm wide. Spikelets to 12 mm long; 3 mm wide. Culms soft, spongy; inflorescence a raceme, embraced below by the uppermost leaf sheath; spikelets solitary, subtended by a lobed herbaceous scale, with one lobe free and awnlike, to 20 mm long.

Flowering December to February. In stagnant and running water. Rare. Highlands of eastern Africa.

Description: Du Toit, Bothalia 12, 2 (258). Illustration: Clayton et al. 1970–1982 (fig. 154). Voucher: P.V.C. du Toit 1083. PRECIS code 9901430-00100.



Fig. 142. *Odontelytrum abyssinicum*

Odyssea Stapf

Perennial (glaucous); long-rhizomatous (sand binding). Culms 50–750 mm high (and creeping); herbaceous; branched above, or unbranched above. *Plants conspicuously armed (leaf blades short, rigid and very pungent-tipped). Leaf blades flat and rolled (inrolled from the flat base); hard, woody, needle-like. Ligule a fringe of hairs.*

Inflorescence paniculate; contracted (fairly to very); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 5–9 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. Glumes two; very unequal; markedly shorter than the spikelets; awnless (but sometimes with the nerve tip constituting a tiny mucro); similar (thinly membranous to hyaline). Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2–8. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (membranous with scarious margins, or scarious); without a germination flap; 3 nerved; incised; mucronate. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3 (the anthers long). Ovary glabrous. Fruit small (1.1–1.5 mm); ellipsoid; hilum short; pericarp free; embryo large (around 1/3 grain length).

Photosynthetic pathway and related features. C₄; XyMS+. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 2 species. Coastal Red Sea, tropical and southern Africa. Xerophytic; in open habitats; halophytic. Namibia, Botswana, Transvaal, and Cape Province. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.



Fig. 143. *Odyssea paucinervis*

***Odyssea paucinervis* (Nees) Stapf**

(=*Diplachne cinerea* Hack.) 1.

Steekriet, prickly brack grass.

Mat-forming perennial; rhizomatous (with dense tufts of spiny glaucous shoots at the nodes); 100–750 mm tall. Leaf blades 10–60 mm long; 1–5 mm wide. Spikelets 5–9 mm long. Rhizomes very long, well developed, deeply buried; panicle 15–70 mm long; spikelets fewer than 15, 4–9-flowered.

Flowering October to May. Brackish or saline soil, in or near pans or rivers. Locally common. Biome: Savanna, Nama-Karoo, Succulent Karoo, and Desert. Tropical Africa south of the Congo River. Natural pasture (eaten by stock because of salty deposits on leaves). Tufts tend to grow in rows, due to the long rhizomes.

Description: Chippindall 1955 (118), Clayton et al. 1970–1982 (288). Illustration: Chippindall 1955 (fig. 89), Clayton et al. 1970–1982 (fig. 79). Voucher: Acocks 15602. PRECIS code 9903451–00100.

Fig. 143. Pl. 132.



***Olyra* L.**

Mapira Adans.

Perennial. Culms 500–5000 mm high; woody and persistent; scandent (twining), or not scandent; branched above. Leaf blades ovate; pseudopetiolate; disarticulating from the sheaths. Ligule an unfringed membrane. Plants monoecious with all the fertile spikelets unisexual (the male spikelets immediately beneath the female, or the lower parts of the panicle exclusively male). The spikelets of sexually distinct forms on the same plant.

Inflorescence paniculate; spatheate, or espatheate (?). Spikelet-bearing axes persistent. The male spikelets with 3 free stamens. Female-fertile spikelets 5–10 mm long; compressed dorsiventrally; falling with the glumes (?). Glumes one per spikelet; long relative to the adjacent lemmas; awnless, or awned (often caudate-acuminate). Proximal incomplete florets 1; sterile.

Female-fertile florets 1. Lemmas becoming indurated; entire; awnless. Palea present; relatively long; 2-nerved. Lodicules 3. Stamens 0. Ovary glabrous, or hairy. Hilum long-linear; embryo small.

Transverse section of leaf blade. Mesophyll with arm cells; with fusoids. Midrib with one bundle only, or with a conventional arc of bundles, or vascularization complex.

Cytology, classification, distribution. Bambusoideae; Oryzodae; Olyreae. 23 species. Tropical America, Africa. Mesophytic; in shade (of forests); glycophytic. Natal and Cape Province. 1 species, indigenous or possibly naturalized.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by G.E. Gibbs Russell.

***Olyra latifolia* L.**

Perennial (bamboo-like); scrambler (erect or straggling); 900–3000 mm tall. Leaf blades to 170 mm long; 25–70 mm wide (flat, pseudopetiolate, broadly lanceolate, cross-veins visible). Spikelets (female-fertile) 7–10 mm long (excluding awns, the male spikelets smaller). Inflorescence a scanty whitish panicle.

Flowering December to May. Wet forests, climbing over shrubs. Rare. Locally common. Possibly naturalized from

Fig. 144. Pl. 133.



tropical America. Biome: Forest. Tropical America, Africa and Madagascar.

Description: Chippindall 1955 (453), Clayton et al. 1970–1982 (17). Illustration: Chippindall 1955 (fig. 376), Clayton et al. 1970–1982 (fig. 6). Voucher: Smook 5527. PRECIS code 9901660–00100.



Fig. 144. *Olyra latifolia*

Oplismenus P. Beauv.

Hekaterosachne Steud., *Hippagrostis* Kuntze, *Orthopogon* R. Br.

Annual, or perennial; decumbent. Culms 100–1000 mm high; herbaceous; freely branched above. Leaf blades linear to ovate; flat (thin). *Ligule a fringed membrane (very short), or a fringe of hairs.*

Inflorescence of spike-like main branches (short racemes); open; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary, paired or in clusters, distant or approximate; biseriate; not in distinct 'long-and-short' combinations; abaxial; compressed laterally (weakly), or not noticeably compressed to compressed dorsiventrally; falling with the glumes. Hairy callus present. Glumes two; more or less equal; awned (both or at least the lower, awn of lower always longer, the awns often viscid); similar (herbaceous). Proximal incomplete florets 1; paleate, palea fully developed to reduced; male, or sterile.

Female-fertile florets 1. Lemmas similar in texture to the glumes, or decidedly firmer than the glumes (papery to coriaceous); smooth (shining); becoming indurated, or not becoming indurated; hairless (smooth, glossy); having the margins tucked in onto the palea; with a clear germination flap; 3–5 nerved; entire; awnless. Palea present; relatively long. Lodicules 2; fleshy. Stamens 3. Ovary glabrous. Fruit ellipsoid; hilum short to long-linear (oblong, up to a half as long as the fruit); embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 9, 10$, and 11 . Panicoideae; Panicoideae; Paniceae. 5 species. Tropical and subtropical. Mesophytic; in shade (forest); glycophytic. Namibia, Botswana, Transvaal, Swaziland, Natal, and Cape Province. 3 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

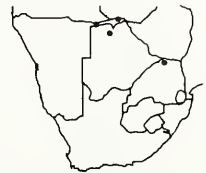
- 1(0). Awns minutely scabrid; plant annual **O. burmannii**
- Awns smooth, sticky; plant perennial 2
- 2(1). Spikelets 6–20 per inflorescence, arranged in racemes **O. hirtellus**
- Spikelets 2–6 per inflorescence, arranged in fascicles **O. undulatifolius**

Oplismenus burmannii (Retz.) Beauv.

Prostrate annual; 100–250 mm tall. Leaf blades 10–60 mm long; 5–20 mm wide. Spikelets 2.5–3.5 mm long. Spikelets hairy; glumes with minutely scabrid awns 3–20 mm long.

Flowering February to April. In forest shade. Rare (in southern Africa). Biome: Savanna and Forest. Tropical Africa, Asia, America.

Description: Clayton et al. 1970–1982 (542). Voucher: P.A. Smith 583. PRECIS code 9901150–00100.



Oplismenus hirtellus (L.) Beauv.

Prostrate perennial (sometimes climbing in undergrowth); 150–800 mm tall. Leaf blades to 130 mm long; 4–20 mm wide. Spikelets 2–4 mm long. Inflorescence of racemes, with 6–20 spikelets; glumes with smooth sticky awns 3–14 mm long.

Flowering January to June

Fig. 145. Pl. 134.





Fig. 145. *Optismenus hirtellus*

(rarely at other times). In forest shade. Locally common. Biome: Savanna and Forest. Throughout tropics except southeastern Asia. Variable in leaf and inflorescence, intergrading with *O. undulatifolius*, which has clumped spikelets. Depauperate specimens may be difficult to place.

Description: Chippindall 1955 (362), Clayton et al. 1970–1982 (543). Illustration: Chippindall 1955 (fig. 313). Voucher: Liebenberg 8035. PRECIS code 9901150–00200.

***Optismenus undulatifolius* (Ard.) Roem. & Schult.**

Trailing perennial; 150–500 mm tall. Leaf blades 10–70 mm long; 4–15 mm wide. Spikelets 2.5–4.0 mm long. Inflorescence of 2–6 fascicled spikelets in wedge-shaped clumps; glumes with smooth, sticky awns 7–14 mm long.



Flowering January to July. In forest shade. Locally common. Biome: Savanna and Forest. Temperate areas in northern hemisphere and upland areas in Africa. Intergrades with *O. hirtellus*, which has spikelets in racemes.

Description: Stapf 1919 (495). Voucher: Davidse 5827. PRECIS code 9901150–00300.

***Oropetium* Trin.**

Annual, or perennial; caespitose (dwarf, cushion-forming). Culms 20–150(–170) mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat, or folded, or rolled. Ligule an unfringed membrane, or a fringed membrane.

Inflorescence a single spike (straight, curved, sinuous or coiled); espatheate. Spikelet-bearing axes persistent, or disarticulating; when fragile disarticulating at the joints (or fracturing into segments of 1–4 spikelets).

Spikelets solitary; distichous; 2.5–3.5 mm long; compressed laterally; disarticulating above the glumes, or falling with the glumes (and with the joint). Glumes two, or one per spikelet (G1 sometimes vestigial or missing); relatively large (G2); very unequal (except in terminal spikelets); much exceeding the spikelets; awnless; very dissimilar (G1 reduced and scarious or missing, G2 covering the florets, hardened). All florets female-fertile, or one distal incomplete floret present, merely underdeveloped (male or sterile); proximal incomplete florets absent.

Female-fertile florets 1 (rarely, the second floret also hermaphrodite?). Lemmas less firm than the glumes (hyaline); without a germination flap; incised; 3 nerved; mucronate, or awned. Awns when present 1; from the sinus (or mucronate); non-geniculate; much shorter than the body of the lemma. Palea present; relatively long (oblong). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (about 1.5 mm long); fusiform; hilum short; pericarp loosely adherent (removable when soaked); embryo small (about 1/4 the length of the fruit).

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 3–4 species. Arid subtropical Africa and mountains. Mesophytic to xerophytic; in open habitats (in shallow soil between or over rocks and in outwashes); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Natal, and Cape Province. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Oropetium capense Stapf

Haasgras, dwarf grass.

Dwarf perennial; densely tufted; 25–100 mm tall (rarely to 170 mm). Leaf blades 10–40 mm long; to 1.2 mm wide. Spikelets 2.5–4.0 mm long. Spikes solitary, straight or curved; spikelets sunk into the rachis; upper glume 2–3 mm long.

Flowering December to May. In shallow soil in open places or rocky outcrops or in crevices and hollows on exposed rocks, often in badly grazed or disturbed veld. Locally common. Biome: Savanna, Grassland, and Nama-Karoo. Eastern tropical Africa to Chad and Somalia.

Description: Stapf 1898–1900 (742), Chippindall 1955 (204), Clayton et al. 1970–1982 (306). Illustration: Chippindall 1955 (fig.180). Voucher: Van Rooyen 3130. PRECIS code 9903200–00100.

Fig. 146. Pl. 135.

Fig. 146. *Oropetium capense***Oryza** L.*Padia* Moritzi.

Annual, or perennial; long-rhizomatous, or caespitose. Culms 300–3000 mm high; herbaceous. *Leaves* usually *auriculate*. Leaf blades flat; pseudopetiolate, or not pseudopetiolate. *Ligule* an *unfringed membrane*. *Plants* *bisexual*, with *bisexual spikelets*.

Inflorescence *paniculate*; *espathate*. *Spikelet-bearing axes* *persistent*.

Spikelets 4–12 mm long; compressed laterally; disarticulating above the glumes (if the pedicel cup is interpreted as glumes). *Hairy callus* *absent*. *Glumes* present to absent (represented only by a small 2-lobed cupule); if present

two; *minute*; more or less equal; awnless. *Proximal incomplete florets* 2 (small, vestigial, sometimes only bristles); *epaleate*; *sterile*.

Female-fertile florets 1. Lemmas 3–9 nerved; entire; awnless, or mucronate, or awned. Awns when present 1. Awns apical; non-geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; relatively long (but narrower than the lemma); with several nerves. Lodicules 2; membranous (but the membranous flange may be narrow); glabrous. Stamens 6. Ovary glabrous. Fruit small, or medium sized, or large; hilum long-linear; embryo small.

Transverse section of leaf blade. Mesophyll with arm cells; without fusoids. Midrib vascularization complex.

Cytology, classification, distribution. Chromosome base number, $x = 12$. Bambusoideae; Oryzodae; Oryzeae to Olyreae. 25 species. Tropical. Hydrophytic or helophytic; in shade (wet forests) or open habitats (swamps); glycophytic. Namibia, Botswana, Transvaal, and Swaziland. Indigenous species (3), cultivated species (1).

Intergeneric hybrid claimed with *Triticum*: *X Oryticum* Wang & Tang in *Acta Phytotax. Sin.* 20: 179 (1982).

References. 1. Clayton. 1970. FTEA. 2. Launert. 1971. FZ. 10(1).

Species treatment by G.E. Gibbs Russell.

1(0). Ligule of lowest leaves longer than 15 mm, apex acute; plants perennial, with long rhizomes

. ***O. longistaminata***

Ligule of lowest leaves shorter than 10 mm, truncate or rounded; plants annual 2

2(1). Spikelets 7–11 mm long ***O. barthii***

Spikelets 5–6 mm long ***O. punctata***

Oryza barthii A. Chev.

Robust annual; hydrophyte; to 1500 mm tall. Leaf blades to 450 mm long; to 15 mm wide. Spikelets 7–11 mm long (awns 40–160 mm long). Ligule 2–6 mm long, truncate.

Flowering February to March. Floodplain pans. Rare. Tropical Africa.

Description: Clayton et al. 1970–1982 (30). Voucher: P.A. Smith 1937. PRECIS code 9901580–00050.

**Oryza longistaminata** A. Chev. & Roehr.

Fig. 147. Pl. 136.

(=*O. barthii* auctt., non A. Chev.) 1.

Wild rice.

Perennial; hydrophyte and rhizomatous (rhizomes extensive, branched); to 1200 mm tall (culms spongy). Leaf blades to

450 mm long; to 15 mm wide. Spikelets 7–9 mm long (awns 40–80 mm long). Ligule 15–45 mm long, acute.

Flowering October to May. Swamps and floodplains, often in deep water. Locally common. Throughout tropical Africa and Madagascar. *O. sativa*, the cultivated rice, is grown in southern Africa. It is an annual with a long ligule and the spikelets are awnless. Escapes from cultivation have not been reported.

Description: Chippindall 1955 (32), Clayton et al. 1970–1982 (30). Illustration: Clayton et al. 1970–1982 (fig. 10(8)). Voucher: Killick & Leistner 3029. PRECIS code 9901580–00100.

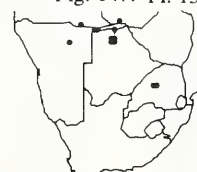


Fig. 147. *Oryza longistaminata****Oryza punctata* Steud.**

Annual; hydrophyte; 600–1200 mm tall (culms spongy). Leaf blades to 300 mm long; to 10 mm wide. Spikelets 5–6 mm long (awns 10–70 mm long). Ligule 3–10 mm long, truncate.



Flowering November to April. Floodplain pans, rice paddies. Rare. Tropical Africa and Madagascar, Thailand. Weed (in rice fields).

Description: Clayton et al. 1970–1982 (31). Illustration: Clayton et al. 1970–1982 (fig. 10). Voucher: Ward 2054. PRECIS code 9901580–00200.

***Oryzidium* C.E. Hubb. & Schweick.**

Perennial; long-stoloniferous. Culms 400–1200 mm high (the lower internodes trailing in water or floating); herbaceous; branched above. Leaf blades linear; flat. *Ligule a fringe of hairs. Plants without hermaphrodite florets (the lower floret male, the upper female).*

Inflorescence panicleate; narrow, the branches nearly erect; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 8–10 mm long; compressed dorsiventrally; falling with the glumes. Glumes two; very unequal; awned (upper glume attenuate into a long straight awn); very dissimilar (the G1 a small, membranous, truncate scale, the G2 large, firm, awned). *Proximal incomplete florets 1*; paleate, palea fully developed; male (with 3 stamens).

Female-fertile florets 1. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (thinly coriaceous); smooth; not becoming indurated; hairless; having the margins lying flat and exposed on the palea; with a clear germination flap; 7 nerved; entire; mucronate (or mucronulate). Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 0. Ovary glabrous. Fruit small (3–3.5 mm); ellipsoid. Hilum short; embryo large.

Photosynthetic pathway. C₄. The anatomical organization conventional. XyMS+. PCR cell chloroplasts seemingly centripetal.

Cytology, classification, distribution. Panicoideae; Panicoideae; Paniceae. 1 species. Southern tropical Africa. Hydrophytic (in permanent water); in open habitats; glycophytic. Namibia and Botswana. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Launert. 1970. FSWA.

Species treatment by H.M. Anderson.

***Oryzidium barnardii* C.E. Hubb. & Schweick.**

Fig. 148. Pl. 137.

Perennial; hydrophyte; floating culms to 1200 mm tall. Leaf blades 150–200 mm long; 6–8 mm wide. Spikelets 8–10 mm long; 1.5 mm wide. Culms rooting and branching at the lower nodes; leaf sheaths broad, papery and straw coloured; lower glume an ovate, white scale 1–2 mm long; upper glume 8–10 mm long with scabrid awn 10–18 mm long; female-fertile (upper) floret separated from the lower by a rachilla internode 1 mm long.



Flowering October to May. Pans and dams. Infrequent. Biome: Savanna. Zambia and Zimbabwe.

Description: Chippindall 1955 (425). Illustration: Chippindall 1955 (fig. 354). Voucher: Smith 1944. PRECIS code 9901142–00100.



Fig. 148. *Oryzidium barnardii*

fertile spikelets 4–6 mm long; compressed dorsiventrally; falling with the glumes (and with the adjacent joint). Glumes two; more or less equal; awnless; very dissimilar (G1 obtuse, leathery, G2 apically notched or entire, membranous-hyaline). *Proximal incomplete florets 1; epaleate; sterile.*

Female-fertile florets 1. Lemmas less firm than the glumes; entire; awnless. Palea present, or absent; when present very reduced (adherent to the lodicules). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; embryo large.



Fig. 149. *Oxyrhachis gracillima*

Oxyrhachis Pilg.

Perennial; caespitose. Culms 200–800 mm high; herbaceous; unbranched above. Leaf blades linear; folded, or rolled. Ligule a fringed membrane, or a fringe of hairs (short). Plants bisexual, with bisexual spikelets.

Inflorescence a single spike (narrow, cylindrical, terminating the culm); espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes cylindrical spikes; solitary; with substantial rachides; disarticulating at the joints. 'Articles' without a basal callus-knob.

Spikelets solitary (or theoretically in pairs, the 'pedicel' fused with and indistinguishable from the rachis). Female-

Cytology, classification, distribution. Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. 1 species. Tropical Africa, Madagascar. Helophytic; in open habitats (streamsides and marshy places); glycophytic. Natal and Cape Province (Transkei). 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

***Oxyrhachis gracillima* (Bak.) C.E. Hubb.**

Fig. 149. Pl. 138.

Perennial; densely tufted; 200–600 mm tall. Leaf blades 50–300 mm long, filiform. Spikelets (sessile) 3–6 mm long (pedicellate spikelets completely absent, no pedicel). Inflorescence very slender with sunken spikelets; glumes smooth.

Flowering June. Wet places.

Rare and conservation status not known. Tropical Africa.

Description: Clayton et al. 1970–1982 (855). Illustration: Clayton et al. 1970–1982 (fig. 204). Voucher: Huntley 791. PRECIS code 9900341–00100.



***Oxytenanthera* Munro**

Houzeaubambusa Mattei, *Scirpobambusa* Kuntze. Sometimes included in *Dendrocalamus*.

Perennial; caespitose. Culms 3000–13000 mm high (somewhat crooked, bending over to the ground); woody and persistent (forming dense clumps). Culms reaching 20–100 mm in diameter. Culms branched above (at the nodal line). Leaf blades linear-lanceolate to lanceolate; flat; pseudopetiolate; disarticulating from the sheaths. Ligule an unfringed membrane. The spikelets of sexually distinct forms on the same plant (there being numerous sterile spikelets).

Inflorescence a false spike, with clusters of spikelets on reduced axes (often reduced to a single terminal cluster); spatheate (each spikelet cluster subtended by a papery sheath, and individual female-fertile spikelets by several short, papery 'bracts').

Spikelets 15–45 mm long; associated with bractiform involucre; compressed laterally to not noticeably compressed; falling with the glumes. Glumes two (cross-veined); very unequal; decidedly shorter than the adjacent lemmas; awnless; similar (papery to leathery). Proximal incomplete florets 1–3; male, or sterile (the paleas when present two-keeled).

Female-fertile florets 1. Lemmas 11–23 nerved (with cross-nerves); entire; mucronate to awned. Awns 1; median. Awns apical; non-geniculate; to 7 mm long. Palea present; relatively long (may exceed the lemma); with several nerves (16–19). Stamens 6. Ovary glabrous (but the style mostly shortly hairy); with a conspicuous apical appendage; the appendage long, stiff and tapering. Stigmas 3. Fruit large; hilum long-linear; embryo small.

Transverse section of leaf blade. Mesophyll without arm cells; with fusoids. Midrib vascularization complex.

Cytology, classification, distribution. Chromosome base number, $x = 12$. Bambusoideae; Bambusodae; Bambuseae.

1 species. Africa. Mesophytic; in shade (growing in the protection of larger trees); glycophytic. Transvaal. 1 indigenous species.

References. 1. Clayton. 1970. FTEA.

Species treatment by G.E. Gibbs Russell.



Fig. 150. *Oxytenanthera abyssinica*

***Oxytenanthera abyssinica* (A. Rich.) Munro**

Fig. 150.

Bamboo; rhizomatous; to 10000 mm tall (culms 50–100 mm in diameter). Leaf blades 50–250 mm long; 10–30 mm wide. Bamboo with drooping culms and clustered leaf-bearing branches; sheaths of culm leaves with dense hairs on the inner surface.

Flowering unknown in southern Africa. In shade of larger trees. Rare. Biome: Savanna. Tropical Africa. Domestic use (flutes). Maintained in semi-cultivation by the Venda.

Voucher: Smook & Soderstrom 1983. PRECIS code 9904770–00100.



Panicum L.

Chasea Nieuw., *Coleataenia* Griseb., *Dileucaden* (Raf.) Steud., *Eatonia* Raf., *Eriolytrum* Kunth, *Milium* Adans., *Monachne* P. Beauv., *Phanopyrum* (Raf.) Nash, *Polyneura* Peter, *Psilochloa* Launert, *Setiacis* S.L. Chen and Y.X. Jin (?— original description inadequate).

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 200–4000 mm high; woody and persistent, or herbaceous; branched above, or unbranched above. *Leaf blades* flat (usually); *not disarticulating*. Ligule an unfringed membrane, or a fringed membrane to a fringe of hairs. *Plants with hermaphrodite florets*.

Inflorescence paniculate (except in the *Stolonifera* group, where it consists of racemes and the distiction from *Brachiaria* breaks down); open, or contracted; espathate. *Spikelet-bearing axes persistent*. Spikelets not secund (except the American *Agrostoides* group, '*Psilochloa*', etc.). *Pedicel apices cupuliform*.

Spikelets not in distinct 'long-and-short' combinations; 1.4–6 mm long (narrowly elliptic, usually more or less acute); adaxial (in the few cases where the orientation is ascertainable); *compressed dorsiventrally* (with very few exceptions: e.g. *P. hemitomum*); falling with the glumes, or not disarticulating. Glumes two; nearly always very unequal; nearly always awnless (the G2 truncate to pointed, very rarely shortly awn-tipped); very dissimilar, or similar (herbaceous-membranous, the lower sometimes very short and nerveless). *Proximal incomplete florets* 1 (rarely 2); paleate, or epaleate, palea when present fully developed to reduced; male, or sterile. *Proximal lemmas less firm than the female-fertile lemmas*.

Female-fertile florets 1. Lemmas similar in texture to the glumes, or decidedly firmer than the glumes; smooth (rarely rugose: subgenus *Megathyrsus* (*P. maximum*)); becoming indurated, or not becoming indurated (coriaceous, bony or cartilaginous); hairless; having the margins tucked in onto the palea; with a clear germination flap; 3–11 nerved; entire; awnless (rarely minutely apiculate). Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short (linear in (e.g.) *P. glutinosum*, *P. macranthum*, *P. pilgerianum* = *Psilochloa*); embryo large.

Photosynthetic pathway. C₄, or C₃ (with a very few species intermediate). The anatomical organization when C₄ conventional, or unconventional. Organization of PCR tissue in a few C₄ species *Alloteropsis* type. Biochemical type PCK (5 species), or NAD-ME (14 species), or NADP-ME (4 species); XyMS+ (C₃, or C₄ NAD-ME or PCK), or XyMS-. PCR cell chloroplasts centrifugal/peripheral, or centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 7, 9$, and 10 . Panicoideae; Panicoideae; Paniceae. About 370 species. Tropical, subtropical and warm temperate. Mesophytic, or xerophytic; in shade and in open habitats (diverse habitats); maritime-arenicolous (occasionally sandbinding — e.g. *P. pinifolium*), or glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (40), naturalized species (1).

References. 1. Chippindall. 1955. Gr. & Past. 2. Launert. 1970. FSWA. 3. Clayton & Renvoize. 1982. FTEA. 4. Clayton & Renvoize. 1986. Genera Graminum. 5. Renvoize. 1989. Kew Bull. 44: 544.

Species treatment by L. Smook.

- 1(0). Glumes and lemma of the lower floret pectinate at the apex **P. ecklonii**
 Glumes and lemma of the lower floret entire 2
 2(1). Inflorescence branches with flat glandular patches 3
 Inflorescence branches eglandular, or if glandular the patches not flat 4



Fig. 151. *Panicum maximum*

- 3(2). Leaves thin; plant usually erect; female-fertile (upper) lemma densely verruculose . **P. heterostachyum**
 Leaves thick and slightly leathery; plant usually trailing; female-fertile (upper) lemma smooth and shiny, sometimes with scattered papillae at the base and apex **P. glandulopaniculatum**

- 4(2). Female-fertile lemma conspicuously transversely rugose (in *P. obumbratum* the female-fertile (upper) lemma is minutely rugose, but the spikelets are over 3 mm long) 5
 Female-fertile lemma sculpturing not conspicuously rugose (if minutely rugose, spikelets less than 3 mm long) 7
- 5(4). Plants trailing, inflorescence narrow, with a few spikelets only; female-fertile (upper) lemma minutely rugose ***P. obumbratum***
 Plants usually erect, sometimes geniculate and rooting at the lower nodes; inflorescence lax or contracted, with many spikelets; female-fertile (upper) lemma conspicuously rugose 6
- 6(5). Spikelets 2.5–3.0(–4.0) mm long, cartilaginous; inflorescence usually much branched, secondary branches usually flexible; most of the nerves on the lemma of the lower floret are clearly visible on the closed spikelet ***P. maximum***
 Spikelets 3.2–3.5 mm long, somewhat leathery; inflorescence sparsely branched because the secondary branches are usually absent; only the central nerve on the lemma of the lower floret is usually clearly visible on the closed spikelet
 ***P. infestum***
- 7(4). Palea of lower floret absent or reduced in length, being conspicuously shorter than the lower lemma; lower floret always sterile 8
 Palea of lower floret well developed, or if reduced usually reduced in width only (if reduced in length then the spikelets with lower floret male); lower floret usually male, occasionally sterile (sometimes mixed on the same inflorescence) 20
- 8(7). Upper glume (10–)11–14-nerved; lemma of the lower floret (9–)10–11-nerved; inflorescence enclosed in the two uppermost leaves, not extending beyond the leaf apex ***P. gilvum***
 Upper glume 3–9-nerved; lemma of the lower floret 5–9-nerved; inflorescence well exerted from the uppermost leaf, or if the base is enclosed then the inflorescence extends beyond the leaf tip 9
- 9(8). Spikelets 5.0–6.5(–7.0) mm long ***P. volutans***
 Spikelets to 4 mm long 10
- 10(9). Lower glume as long as the spikelet; plant scrambling, sometimes rooting at the lower nodes; spikelets pubescent ***P. aequinerve***
 Lower glume to 3/4 the length of the spikelet, or if as long as the spikelet then the plant not scrambling and the spikelets glabrous 11
- 11(10). Upper glume 3–5-nerved 12
 Upper glume 7–9-nerved 15
- 12(11). Upper glume 3-nerved; female-fertile (upper) lemma with a green spot at the apex
 ***P. comorense***
 Upper glume 5-nerved; female-fertile (upper) lemma lacking a green spot at the apex 13
- 13(12). Spikelets 1.5–2.5 mm long; female-fertile (upper) floret dull and granulose ***P. laticomum***
 Spikelets 2.6–4.0 mm long (occasionally less), female-fertile (upper) floret shiny and smooth 14
- 14(13). Plant shrub-like, culms hard and wiry, erect; lower glume narrowly ovate, 3-nerved, 3/4 as long as the spikelet; leaves up to 4.5 mm wide
 ***P. dewinteri***
 Plant usually soft, decumbent or trailing; lower glume broadly ovate, 0–1-nerved, 1/4–1/2 the length of the spikelet; leaves (5–)10–25 mm wide
 ***P. monticola***
- 15(11). Perennial, shrub-like; culms hard, wiry and branching, particularly in the upper portion
 ***P. dewinteri***
 Annuals or short-lived perennials; culms not hard and wiry, rarely branching in the upper portion 16
- 16(15). Inflorescence branches with spikelets appressed and appearing close together 17
- Inflorescence branches with spikelets spreading and therefore distant from each other 18
- 17(16). Upper leaf surface densely covered with large prickles which are usually white (always visible on upper leaves) and minute papillae
 ***P. subalbidum***
 Upper leaf surface without prickles, densely covered with papillae ***P. impeditum***
- 18(16). Spikelets 1.8–2.2 mm long, often entirely tinged purple when mature; inflorescence branches modestly covered with prickles less than 0.05 mm long just below the spikelets; mature inflorescence well exerted from uppermost leaf
 ***P. atrosanguineum***
 Spikelets 2–3 mm long, only tinged purple at the apex of glumes and lemmas; inflorescence branches densely scabrid with prickles 0.10–0.15 mm long just below the spikelets; base of inflorescence usually enclosed in the uppermost leaf 19
- 19(18). Inflorescence broadly ovate, branches long and flexible ***P. novemnerve***
 Inflorescence obovate, branches usually short and rigid ***P. arcurameum***
- 20(7). Lemma of the lower floret 5-nerved 21
 Lemma of the lower floret 7–11(–14)-nerved 28
- 21(20). Spikelets 3.3–5.5 mm long, clavellate hairs usually present on inflorescence branches ***P. deustum***
 Spikelets up to 3 mm long, clavellate hairs absent 22
- 22(21). Female-fertile floret sparsely to densely granulose or papillose 23
 Female-fertile floret smooth 24
- 23(22). Lower glume to 1/2 the length of the spikelet; lower floret palea coriaceous, longer than the lemma; spikelets oblong, appressed on and hiding the inflorescence branches ***P. hians***
 Lower glume 1/2–3/4 the length of the spikelet; lower floret palea membranous, never longer than the lemma; spikelets nearly rounded in outline, not appressed to inflorescence branches which are visible between the spikelets
 ***P. natalense***
- 24(22). Spikelets 1.3–1.8 mm long; glume apex not recurved or mucronate; inflorescence 10–60 mm long 25
 Spikelets 2–3 mm long; glume apex recurved, usually shortly mucronate; inflorescence 80–150 mm long 26
- 25(24). Leaves not reflexed, linear-lanceolate, tapering to a long acuminate tip, base straight; lower glume 1/3 the length of the spikelet
 ***P. subflabellatum***
 Leaves often reflexed at maturity, lanceolate to narrowly ovate, tip acute, base cordate; lower glume 1/2–2/3 the length of the spikelet
 ***P. parvifolium***
- 26(24). Basal sheaths silky pubescent ***P. dregeanum***
 Basal sheaths glabrous or sparsely hispid, not silky pubescent 27
- 27(26). Culms usually stout, (2.0–)3.5–7.0 mm wide at the base ***P. fluviicola***
 Culms usually slender, 1–2 mm wide at the base
 ***P. genuflexum***
- 28(20). Lower leaf sheaths densely covered with matted woolly hairs ***P. lanipes***
 Lower leaf sheaths glabrous to densely hairy, hairs not matted and woolly 29
- 29(28). Lower glume narrowly ovate; clavellate hairs usually present on inflorescence branches
 ***P. hymeniochilum***
 Lower glume ovate to broadly ovate; clavellate hairs never present on inflorescence branches 30
- 30(29). Lower floret lemma with interspaces between the nerves broadest adjacent to the central nerve 31

- Lower floret lemma with the broadest interspaces between nerves not confined to those by the central nerve 32
- 31(30). Spikelets 2.0–3.5 mm long **P. repentellum**
Spikelets 4–6 mm long **P. pilgerianum**
- 32(30). Rhizomes stout, long and creeping ... **P. repens**
Rhizomes absent, or if present, short and compact 33
- 33(32). Upper glume 5-nerved; spikelets to 1.8 mm long, spherical **P. subflabellatum**
Upper glume (5–)7–11-nerved; spikelets 2 mm or longer, not spherical 34
- 34(33). Plants annual 35
Plants perennial 38
- 35(34). Spikelets 4–6 mm long **P. pilgerianum**
Spikelets 2.0–3.5 mm long 36
- 36(35). Inflorescence with branches appressed and ascending, and closely associated with and enclosed on the one side by the upper leaf blade; lower florets always sterile **P. sp. 1 (=Smook 3463)**
Inflorescence with branches open, not appressed, not closely associated with uppermost leaf blade; lower florets male or sterile in the same inflorescence 37
- 37(36). Inflorescence obovate to broadly obovate; spikelets acute; upper glume apex usually with a small mucro-point and slightly recurved backwards; plants yellowish green . **P. sp. 2 (=Giess 8605)**
Inflorescence oblanceolate to narrowly obovate, spikelets blunt; upper glume apex not mucronate or recurved backwards; plants green **P. schinzii**
- 38(34). Spikelets 3.4–4.5 mm long; upper leaf surface densely covered with short hairs, abaxial surface at sheath mouth densely covered with long, woolly hairs **P. kalaharensis**
Spikelets up to 3.2 mm long; upper leaf surface smooth to densely papillate or with scattered hairs; abaxial surface of the sheath mouth glabrous or with short, appressed hairs 39
- 39(38). Culms hard, brittle, branching after the lower 1/4, nodes thickened and swollen, often bulbous; plants shrub-like **P. arbusculum**
Plants not as above 40
- 40(39). Nodes densely covered with appressed hairs; lower glume to 1/4 the length of the spikelet **P. trichonode**
Nodes glabrous or sparsely hairy; lower glume 1/2–2/3 the length of the spikelet **P. coloratum / P. stapfianum complex** (including also **P. bechuanense** and **P. merkeri**)

NOTE: *Panicum miliaceum* L., a cultivated species commonly known as 'proso', is occasionally found as an escape. It has a dense, often drooping inflorescence, spikelets (4.0–)4.5–5.5 mm long clustered towards the upper parts of the branches and a lower palea reduced to a small scale.

Panicum aequinerve Nees

Bosbuffelsgras.

Shortlived perennial, or annual; scrambler (trailing, decumbent and rooting at the nodes); culms to 1000 mm long. Leaf blades 30–110 mm long; 3–10 (–12) mm wide. Spikelets 2.5–3.5 (–4.0) mm long. Inflorescence



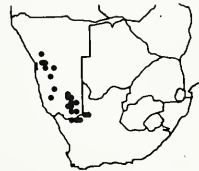
sparsely branched, usually spreading at maturity, sometimes contracted, branches naked for a long distance, with 2–5 spikelets crowded at the apex, exerted from uppermost leaf; spikelets acuminate, pubescent, lower glume as long as the spikelet, 5(–7)-nerved; upper glume 7-nerved; lower floret sterile, the lemma 5-nerved, the palea reduced; female-fertile (upper) lemma pale and shiny.

Flowering September and January to June. Clay or sand on shallow soils of forest margins or open grasslands, mainly in damp places and around boulders. Infrequent to locally common. Biome: Grassland and Forest. Northwards to Uganda, Ethiopia and in Madagascar. Shows much variation in the inflorescence shape and spikelet size. Spikelets are often infected with fungi. Similar to *P. inaequilatum* Stapf & C.E. Hubb. from Zimbabwe and Mozambique, which has a 3-nerved lower glume.

Description: Stapf 1898–1900 (399), Chippindall 1955 (324), Clayton et al. 1970–1982 (495). Illustration: Chippindall 1955 (fig. 281). Voucher: Smook 5486; Smook 5634. PRECIS code 9901160–00100.

Panicum arbusculum Mez

Struikpanicum.



Perennial; tufted (erect); to 800 mm tall. Leaf blades to 100 mm long; to 6 mm wide. Spikelets 2.5–3.0 mm long. Plant shrub-like, glaucous, culms hard and brittle; rhizomes short and strong; culms much branched with nodes thickened and swollen, often bulbous; inflorescence open, sparsely branched, primary branches with long naked bases and bearing spikelets crowded towards the apex; spikelets often flushed with purple; lower glume broadly ovate, up to 1/2 the length of the spikelet; upper glume 7–9-nerved; lower floret male or sterile, lemma 9-nerved, palea well developed; female-fertile (upper) lemma pale-yellow to brown, shiny.

Flowering October to May. Stony places in mountainous areas. Infrequent to locally common. Biome: Nama-Karoo. Endemic. Pasture (good grazing), or erosion control (effective in blocking water drainage).

Description: Muller 1984 (194), Chippindall 1955 (338). Illustration: Muller 1984 (fig. 96). Voucher: Giess 10356. PRECIS code 9901160–00300.

Panicum arcurameum Stapf

Annual; tufted (erect or geniculate); to 600 mm tall. Leaf blades to 100 mm long; to 7 mm wide. Spikelets 2.0–2.5 mm long. Inflorescence obovate, base usually enclosed by uppermost leaf, branches usually short, rigid and ascending, densely scabrid with prickles which are 0.10–0.15 mm long just below point of attachment of the spikelets, which are spreading and distant from one another; the apex of lower glume and lower lemma often tinged purple; lower glume to 2/3 the length of the spikelet; upper glume and lower lemma (7–)9-nerved; lower floret sterile with a reduced palea; female-fertile (upper) lemma pale to dark, shiny.



Flowering January. Sandy soils, black turf in disturbed areas. Infrequent. Biome: Savanna and Nama-Karoo. Southern tropical Africa. Barely distinguishable from *P. novemnerve* and a detailed study is needed in this group. Similar to *P. atrosanguineum*, which has the inflorescence branches moderately scabrid with prickles less than 0.05 mm long just below the spikelet.

Description: Stapf 1920 (704), Chippindall 1955 (327), Clayton et al. 1970–1982 (488). Voucher: Smook 4404. PRECIS code 9901160–00400.

***Panicum atosanguineum* A. Rich.**

Annual; tufted; 100–400 mm tall. Leaf blades to 60 mm long; to 5 mm wide. Spikelets 1.8–2.2 mm long. Inflorescence open, mature inflorescences well exerted from the uppermost leaf, branches moderately scabrid, with prickles less than 0.05 mm long just below the point of attachment of the spikelets, which are distant from one another; spikelets usually strongly flushed with purple; lower glume 3/4 the length of the spikelet, broadly ovate; upper glume and lower lemma 5–7-nerved; lower floret sterile with a reduced palea; female-fertile (upper) lemma usually dark at maturity, shiny.

Flowering February to May. Old farmlands and other disturbed places. Infrequent. Biome: Savanna. Northwards through Zimbabwe, Zaire to tropical east Africa. Also in northwest India. Similar to *P. novemnerve* and *P. arcuameum*, which have the inflorescence branches densely covered with prickles 0.10–0.15 mm long just below the spikelet attachment.

Description: Stapf 1920 (703), Chippindall 1955 (328), Clayton et al. 1970–1982 (488). Voucher: Smith 2366. PRECIS code 9901160–00450.

***Panicum bechuanense* Brem. & Oberm.**

Perennial; tufted (erect to geniculate); to 600 mm tall. Leaf blades to 100 mm long; 3–5 mm wide. Spikelets to 2.4 mm long. Upper leaf surface densely papillate; leaves and sheaths with bulbous-based hairs; lower glume ovate, 1/2–2/3 the length of the spikelet; upper glume and lower lemma 9-nerved; lower floret male, with the palea well developed; female-fertile (upper) lemma pale to dark, shiny.

Flowering March. Seepage areas in river beds and pans, also in disturbed areas. Infrequent. Biome: Savanna. Endemic. This species, of which only two specimens have been seen for this treatment, belongs to the *P. coloratum*–*P. stapfianum* complex which needs a more detailed study. One of these, Ellis 4366, is anatomically different from *P. coloratum*.

Description: Bremerkamp & Obermeyer 1935 Ann. Trans. Mus. 16 (403), Chippindall 1955 (336). Voucher: Ellis 4366. PRECIS code 9901160–00500.

***Panicum coloratum* L. var. *coloratum***

(=*P. coloratum* L. var. *makarikariense* Goossens) 3.

Witbuffelgras, white buffalo grass.

Perennial; tufted (erect, geniculate or occasionally decumbent); to 1000 mm tall. Leaf blades to 300 mm long; 5–10 mm wide. Spikelets 2.5–3.0 mm long. Lower leaf sheaths glabrous to densely appressed-hairy, bulbous-based hairs present or absent; leaves usually mainly cauline, broad; inflorescence branches spreading with the spikelets distant; lower glume ovate, 1/2–2/3 the length of the spikelet; upper glume and lower lemma 7(–9)-nerved; lower floret male, with the palea well developed; female-fertile (upper) lemma pale to dark, shiny.

Flowering October to May. Sandy or clay soils in river beds, drainage courses, around pans or in depressions. Common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical and subtropical Africa, introduced elsewhere. Palatable and drought-resistant pasture. A highly variable species belonging to the *P. coloratum* – *P. stapfianum*



complex, which also includes *P. bechuanense* and *P. merkeri*. Detailed study is needed to elucidate species limits. There are many distinct ecotypes, a number of which have been selected for pastures such as var. *makarikariense*, a tall, robust, glaucous plant.

Description: Stapf 1920 (713), Chippindall & Crook 1976 (46), Stapf 1898–1900 (409), Chippindall 1955 (335), Clayton et al. 1970–1982 (485). Illustration: Muller 1984 (fig. 97), Chippindall 1955 (fig. 291). Voucher: Merxmueller & Giess 30162, Theron 2091. PRECIS code 9901160–00800.

***Panicum comorense* Mez**

Annual; tufted (trailing, decumbent or erect and rooting at the nodes); culms to 1000 mm long, or sometimes longer. Leaf blades 60–150 mm long; 10–15 mm wide. Spikelets 1.8–2.2 mm long. Leaf apex abruptly acuminate; inflorescence sparsely branched, the secondary branches appressed; spikelets oblong, blunt; lower glume 1/4–1/3 as long as the spikelet; upper glume 3-nerved; lower floret sterile, the lemma 5-nerved, the palea absent; female-fertile (upper) lemma pale, shiny, minutely scaberrulous with a tiny green spot at the apex.

Flowering March. Forest shade. Rare (in the FSA region). Biome: Forest. Throughout tropical Africa; Comoro Is. and Madagascar. Resembles *P. monticola*, which has the upper glume 5-nerved and lacks the green spot at the tip of the female-fertile (upper) lemma.

Description: Clayton et al. 1970–1982 (492). Voucher: Culverwell 757. PRECIS code 9901160–00950.

***Panicum deustum* Thunb.**

Reed panicum, broad-leaved panicum.

Perennial; shortly rhizomatous and tufted (sometimes rooting at lower nodes); to 2000(–2400) mm tall. Leaf blades 150–480 mm long; 5–35(–45) mm wide. Spikelets 3.5–5.0(–5.5) mm long. Culms slender or robust, branched or unbranched; leaves mainly cauline, cordate or straight at the base; inflorescence branches usually with clavellate hairs; lower glume 1/2–2/3 the length of the spikelet, separated by a short internode from the rest of the spikelet; upper glume 7-nerved; lower floret male, lemma 5-nerved and palea well developed; female-fertile (upper) lemma pale, dull or shiny.

Flowering September to April. Often in moist soils, shady places or rocky hillsides on clay, loam or sandy soils. Common (but scattered). Biome: Savanna and Forest. Northwards to Ethiopia and Sudan. Domestic use (grass mats), or pasture (palatable and nutritious, staying green well into dry periods). Variable in size, hairiness and habitat.

Description: Stapf 1920 (651), Chippindall & Crook 1976 (37), Stapf 1898–1900 (403), Chippindall 1955 (328), Clayton et al. 1970–1982 (468). Voucher: Crompton 26639; Godfrey & Acocks SH 1652. PRECIS code 9901160–01000.

***Panicum dewinteri* J.G. Anders.**

Perennial; tufted (erect, sometimes rooting at the lower nodes); to 1000 mm tall. Leaf blades (young leaves) 200–500 mm long; 1–6 mm wide. Spikelets 3.5–4.0 mm long. Plant shrub-like, culms hard and wiry, well branched, particularly in the upper part, leaf blades of the older



portion of the culms falling off early; inflorescence sparsely branched with secondary branches appressed; lower glume narrowly ovate, 3-nerved, 2/3 the length of the spikelet; upper glume and lower lemma 5–7-nerved; lower floret sterile, with the palea reduced; female-fertile (upper) lemma pale to light brown, shiny.

Flowering January to May. Rocky outcrops, in crevices, along forest margins and on wooded rocky slopes. Locally common. Biome: Savanna. Endemic.

Description: Anderson 1967 Bothalia 9,2 (344). Voucher: Raal 377, Raal 143. PRECIS code 9901160–01100.

Panicum dregeanum Nees

Perennial; tufted; to 1100 mm tall. Leaf blades 140–350(–500) mm long; 1.5–3.0 mm wide. Spikelets 2.0–2.5(–3.0) mm long. Basal sheaths silky pubescent, leaves mostly basal; inflorescence 80–150 mm long; spikelets usually strongly flushed with purple; glume tips shortly mucronate and recurved; lower glume 1/2–3/4 the length of the spikelet; upper glume 7-nerved; lower floret male, lemma 5-nerved and the palea well developed; female-fertile (upper) lemma pale and shiny.

Flowering November to April. Usually in wet places, frequently in vleis, sometimes on hillsides. Infrequent to locally common. Biome: Savanna and Grassland. Throughout tropical Africa. Pasture (grazed by cattle). Resembles *P. genuflexum* and *P. fluviicola*, which have glabrous or sparsely hispid basal sheaths.

Description: Chippindall & Crook 1976 (36), Stapf 1920 (684), Stapf 1898–1900 (411), Chippindall 1955 (332), Clayton et al. 1970–1982 (478). Voucher: Smook 1891. PRECIS code 9901160–01200.

Panicum ecklonii Nees

Perennial; shortly rhizomatous and tufted; to 800 mm tall. Leaf blades 60–200(–260) mm long; 3–8 mm wide. Spikelets 2.5–3.5 mm long. Leaves mainly basal, flat, bright green, usually densely hairy with long tubercle-based hairs; spikelets usually flushed with purple; glumes and lower lemma pectinate at the apex; lower floret sterile with the palea absent; female-fertile (upper) lemma dull, often flushed purple and shortly hairy towards the apex.

Flowering September to April. Sandy soils and often in moist areas in mountainous regions that are subjected to burning. Locally common. Biome: Grassland. Northwards to Zaire and Tanzania and west Africa. Botha et al. 1988. S. Afr. J. Bot. 54: 89–93, report that *P. ecklonii* has both C_3 and C_4 forms.

Description: Chippindall & Crook 1976 (47), Stapf 1898–1900 (413), Chippindall 1955 (332), Clayton et al. 1970–1982 (466). Illustration: Chippindall 1955 (fig. 289). Voucher: Kluge 1968, Hoener 1903. PRECIS code 9901160–01300.

Panicum fluviicola Steud.

(=*P. aphanoneurum* Steud.) 3.

Perennial; tufted (erect to geniculate); (300–)600–2300 mm tall. Leaf blades 130–500 mm long; 3–12 mm wide. Spikelets 2.0–2.5 mm long. Plants often flushed with purple, basal sheaths

glabrous, sometimes sparsely hispid; culms usually stout, (2.0–)3.5–7.0 mm wide at the base; inflorescence 80–150 mm long; spikelets green with purple tips to glumes and lower lemma; glumes acuminate to mucronate, recurved; lower glume up to 2/3 the length of the spikelet; lower floret male, lemma 5-nerved, and the palea well developed; female-fertile (upper) lemma pale, smooth and shiny.

Flowering December to May. Sandy loam, sand or heavy clays in seasonally wet open areas. Locally common (where occurring). Biome: Savanna. Scattered throughout tropical Africa. Barely distinct from *P. genuflexum*, which has slender culms that are 1–2 mm wide at the base; also resembles *P. dregeanum*, which has silky-pubescent basal sheaths.

Description: Stapf 1920 (689), Clayton et al. 1970–1982 (478). Voucher: De Winter 4264. PRECIS code 9901160–01450.

Panicum genuflexum Stapf

Perennial; tufted (loosely); to 750(–1000) mm tall. Leaf blades 150–300 mm long; 4–5 mm wide. Spikelets 2.0–2.5 mm long. Basal sheaths glabrous; culms slender, wiry, 1–2 mm wide at the base; inflorescence 80–150 mm long; spikelets often strongly flushed purple; glume tips usually shortly mucronate and recurved; lower glume 2/3–3/4 the length of the spikelet; lower floret usually male, lemma 5-nerved and the palea well developed; female-fertile (upper) lemma pale, smooth and shiny.

Flowering January to March. Usually in sandy soils in marshy areas and grassy clearings. Rare (in FSA area). Locally common. Biome: Savanna. Mozambique to Zaire and east Africa. Barely distinct from *P. fluviicola*, which has stout culms (2.0–)3.5–7.0 mm wide at the base, and *P. dregeanum*, which has silky pubescent basal sheaths.

Description: Stapf 1920 (689), Clayton et al. 1970–1982 (479). Voucher: Smook 1931. PRECIS code 9901160–01500.

Panicum gilvum Launert

(=*P. laevifolium* Hack. var. *contractum* Pilg.) 2.

Annual; hydrophyte and tufted (geniculate, rarely erect); to 650 mm tall. Leaf blades 30–150 mm long; 3–8 mm wide. Spikelets 2.8–3.4 mm long. Inflorescence not exerted beyond the uppermost leaf which is usually about 8 mm wide. Often there are two leaves closely associated with the inflorescence. Secondary inflorescence branches are usually absent and the spikelets are appressed to the branches; lower glume up to 1/3 the length of the spikelet; upper glume (10–)11–14-nerved; lower floret sterile, lemma (9–)10–11-nerved, the palea absent or reduced; female-fertile (upper) lemma pale to yellow, often flushed dark, smooth and shiny.

Flowering January to April. Sandy soils, margin of vleis, dams and waterholes, in ephemeral water, and in disturbed areas. Locally common. Biome: Savanna. Endemic. Resembles a number of other taxa associated with moist habitats: *P. impeditum* and *P. subalbidum*, which have upper glumes with 3–9 nerves, the lemmas of the lower florets with 5–9 nerves, and *P. sp. 1*, which has the lower floret always sterile but a well developed palea.

Description: Launert 1970 Mitt. Bot. München. 8 (153), Chippindall 1955 (334). Voucher: De Winter & Giess 6911, Smith 3300. PRECIS code 9901160–01600.



***Panicum glandulopaniculatum* Renvoize**

Annual; trailing or rambling, often rooting at the nodes; to 1000 mm long. Leaf blades to 100 mm long; 10–25 mm wide. Spikelets 2.0–2.5(–3.0) mm long. Leaves thick and slightly leathery, flat with cordate bases; inflorescence branches with flat glandular patches; the spikelets asymmetrical; glumes as long as the spikelet, pilose; upper glume and lower lemma 5-nerved; lower floret male or sterile, with the palea well developed; female-fertile (upper) lemma shiny, smooth except for scattered papillae occurring sometimes at the base and/or apex.

Flowering sporadically November to June. Forest shade, in sand. Locally common. Zambia, Zimbabwe and Mozambique. Resembles *P. heterostachyum*, which has thinner leaves and a densely verruculose upper lemma, and *P. brevifolium*, which has eglandular inflorescence branches and occurs further north.

Description: Renvoize 1989 Kew Bull. 44: 544. Voucher: Strey 8222. PRECIS code 9901160–01650.

***Panicum heterostachyum* Hack.**

Annual; erect, loosely tufted; 200–800 mm tall. Leaf blades 80–120 mm long; 10–25 mm wide. Spikelets to 1.5 mm long. Plant base may be decumbent; leaves thin, amplexicaul; inflorescence branches with flat glandular patches; spikelets asymmetrical, ovate; glumes as long as the spikelets, sparsely to densely pubescent; upper glume and lower lemma 5-nerved; lower floret male with the palea well developed; female-fertile (upper) lemma pale, densely verruculose.

Flowering January to May (and August). Poor sandy soils in wooded grassland, seasonally flooded pans, rocky hills and in disturbed areas. Locally common. Biome: Savanna. Throughout tropical Africa, also recorded from Guyana and Trinidad. Resembles *P. glandulopaniculatum*, which has thick, leathery leaves, and a smooth female-fertile (upper) lemma which occasionally has scattered papillae on the apex and base.

Description: Chippindall & Crook 1976 (35), Stapf 1920 (733), Chippindall 1955 (327), Clayton et al. 1970–1982 (496). Illustration: Chippindall 1955 (fig. 285). Voucher: Merxmüller & Giess 1963. PRECIS code 9901160–01800.

***Panicum hians* Eil.**

Perennial; tufted (erect, sometimes decumbent to procumbent); to 600 mm tall. Leaf blades to 200 mm long; to 2.5 mm wide. Spikelets 2.2–2.4 mm long. Inflorescence sparsely branched, secondary branches short with the spikelets appressed; lower glume to 1/2 the length of the spikelet, membranous; lower floret male, the lemma 5-nerved, the palea coriaceous, well developed and longer than the lemma; female-fertile (upper) lemma pale, granulose.

Flowering November to January. Damp soils in disturbed places around ponds and streams. Locally common (where growing in the FSA area). Naturalized from North America. Biome: Grassland. North America.

Description: Hitchcock & Chase 1950 (703). Voucher: Wells 1011. PRECIS code 9901160–01900.

***Panicum hymeniochilum* Nees**

(=*P. filiculme* Schinz) 3; (=*P. hymeniochilum* Nees var. *glandulosum* Nees) 3; (=*P. hymeniochilum* Nees var. *hymeniochilum*) 3.



Scrambler and hydrophyte (often rooting at lower nodes); culms 140–2000 mm long. Leaf blades 12–70 mm long; 1.2–5.0(–10.0) mm wide. Spikelets 2.0–2.5(–3.0) mm long. Inflorescence branches sparsely branched, with clavellate hairs usually present, rarely absent; spikelets often purple-tinged; lower glume narrowly ovate, 1/2–2/3 the length of the spikelet; upper glume 7–9-nerved; lower floret male or sterile, the lemma (7–)9–11-nerved, the palea usually well developed, sometimes reduced; female-fertile (upper) lemma granulose, especially towards the apex.

Flowering December to May. Moist organically rich soils of river margins and perennial swamps, in or near water. Locally common. Biome: Savanna, Grassland, and Forest. Northwards to east Africa, Ethiopia and Guinea; also in Madagascar. A few specimens from St. Lucia area are more robust and may represent a new taxon (eg. Feely, Tinley & Ward 22).

Description: Chippindall & Crook 1976 (79), Chippindall 1955 (324), Clayton et al. 1970–1982 (470). Voucher: Ward 5518. PRECIS code 9901160–02100.

***Panicum impenitum* Launert**

Annual; hydrophyte and tufted (geniculate, erect to prostrate); to 500 mm tall. Leaf blades 20–80 mm long; 3–6 mm wide. Spikelets 2.7–3.3 mm long. Upper leaf surface densely covered with papillae; the base of the inflorescence is enclosed by the uppermost leaf but the inflorescence extends beyond tip of the leaf; spikelets are crowded and appressed to the inflorescence branches; lower glume up to 1/2 the length of the spikelet; upper glume and lower lemma 7–9-nerved; lower floret sterile with the palea reduced; female-fertile (upper) lemma pale, smooth and shiny.

Flowering November and January to May. Moist sandy or clay soils around water holes, vleis and pans. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Resembles *P. gilvum*, which has the upper glume (10–)11–14-nerved and the lower lemma of the lower floret (9–)10–11-nerved, *P. sp. 1*, which has the palea of the lower floret well developed, and *P. subalbidum*, which has the upper leaf surface covered with prickles.

Description: Launert 1970 Mitt. Bot. Munchen. 8(150). Voucher: Leistner 2229, Leistner 3152. PRECIS code 9901160–02200.

***Panicum infestum* Peters**

Perennial; shortly rhizomatous and tufted (erect); to 2000 mm tall. Leaf blades 150–500 mm long; 2–10 mm wide. Spikelets 3.5(–4.0) mm long. Plant usually hairy with tubercle-based hairs, rarely glabrous; inflorescence branched sparsely, primary branches ascending, secondary branches usually absent; spikelets acute, somewhat leathery, often with a groove on the back; the closed spikelets with only the central nerve visible on the lemma of the lower floret; lower floret male and the palea well developed; female-fertile (upper) lemma conspicuously transverse-ly rugose.

Flowering November, January, February, and May. Clay or sandy soils in seasonally damp places, rocky hillsides



and disturbed areas. Infrequent. Biome: Savanna and Grassland. Northwards to Zaire, east Africa and Somalia. Similar to *P. maximum*, which has a much more branched inflorescence, cartilaginous spikelets, and the closed spikelets with many nerves clearly visible on the lemma of the lower floret.

Description: Chippindall & Crook 1976 (34), Chippindall 1955 (330), Clayton et al. 1970–1982 (472). Voucher: Acocks 16687. PRECIS code 9901160–02300.

Panicum kalaharens Mez

Robust perennial; shortly rhizomatous and tufted (hard and dense); to 2500 mm tall. Leaf blades to 350 mm long; to 8 mm wide. Spikelets 3.2–4.2 mm long. Basal sheaths densely hairy, leaves mainly basal, flat or rolled, upper leaf surface densely covered with short hairs, sheath mouth with dense, long to woolly hairs on the abaxial side; lower glume broadly ovate, up to 1/2 the length of the spikelet, 3–5-nerved; upper glume and lower lemma 7–9-nerved; lower floret male with the palea well developed; female-fertile (upper) lemma pale and dull.

Flowering December to April. Kalahari sands and disturbed places such as roadsides. Infrequent, or locally common (in dune streets). Biome: Savanna. Zimbabwe. Food and drink (seeds eaten by Wambos), or pasture (reasonably palatable when young, drought resistant). Plants from Namibia that were previously referred to *P. phragmitoides* Stapf are a more broad-leaved form found in the northern part of the distribution range.

Description: Lauenert 1970 (160:136), Chippindall 1955 (338). Voucher: Ellis 2677, Acocks 12488, Story 6373. PRECIS code 9901160–02400.

Panicum lanipes Mez

Wolvoet panicum.

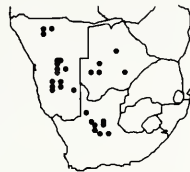
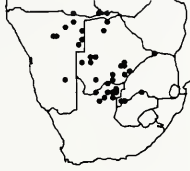
Perennial; densely tufted (erect to geniculate); to 800 mm tall. Leaf blades to 300 mm long; to 6 mm wide. Spikelets 2.0–2.5 mm long. Usually glaucous, basal leaf sheaths densely covered with matted woolly hairs; spikelets light green, sometimes tinged with purple; lower glume up to 2/3 the length of the spikelet; upper glume and lower lemma 7–9-nerved; lower floret male with the palea well developed; female-fertile (upper) lemma pale yellow to brown, shiny.

Flowering September to May. Stony, sandy or calcrete soils in vleis, on mountain slopes or in dry river beds. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Pasture (valuable fodder). Similar to *P. pearsonii* Bol. f., which has a woolly base but longer spikelets (3.0–3.5 mm long). As far as known, *P. pearsonii* has never been recollected since the type specimen. It also resembles *P. coloratum* and *P. stapfianum*, which have glabrous or hairy bases, but then the hairs are not woolly and matted.

Description: Lauenert 1970 (160:136), Chippindall 1955 (337). Illustration: Muller 1984 (fig. 99), Chippindall 1955 (fig. 294). Voucher: Muller 1389, Giess, Volk & Bleissner 6104. PRECIS code 9901160–02600.

Panicum laticomum Nees

Annual; scrambling, decumbent to semi-erect, rooting at the nodes; culms to 2000 mm long. Leaf blades to 100 mm long; (5–)8–28 mm wide. Spikelets 1.5–2.5 mm long. Leaves abruptly or asymmetrically narrowed at the base; inflorescence extending beyond the uppermost leaf, open,



finely and usually profusely branched; lower glume 1/2 the length of the spikelet, separated from the rest of the spikelet by a short internode; upper glume 5-nerved; lower floret sterile, the lemma 5–7-nerved and the palea reduced; female-fertile (upper) lemma pale and granulose.

Flowering January to April (June and July). Sandy soils in dense shade and wet areas in forests. Locally common. Biome: Forest. South central to east Africa.

Description: Stapf 1920 (736), Chippindall 1955 (325), Clayton et al. 1970–1982 (498). Voucher: Culverwell 736, Galpin 2896. PRECIS code 9901160–02700.

Panicum maximum Jacq.

Guinea grass, blousaad soet-gras.

Usually perennial, or annual (occasionally); loosely to densely tufted (erect and geniculate, rooting at the nodes); to 2000 mm tall. Leaf blades 60–400 (–1000) mm long; 4–12 (–35) mm wide. Spikelets 2.5–3.0 (–4.0) mm long. Inflorescence usually much branched with secondary branches well developed and flexuous; spikelets blunt or acute, rounded on the back, cartilaginous; the closed spikelet has many nerves clearly visible on the lemma of the lower floret; lower floret usually male with the palea well developed; female-fertile (upper) lemma pale and conspicuously transversely rugose.

Flowering November to July. In shady places, especially under canopy of trees, in cultivated areas and along river banks, but well adapted to a variety of conditions. Widely common. Biome: Fynbos, Savanna and Nama-Karoo. To tropical Africa, and in Madagascar. Widely introduced throughout tropics. Extensively planted hay and pasture (often grown in the form of selected agricultural strains in the tropics). There is considerable variation in size and indumentum of culms, leaves and inflorescences. Resembles *P. infestum*, which has the inflorescence sparsely branched, secondary branches usually absent, spikelets leathery and the closed spikelets with only the central nerve visible on the lemma of the lower floret.

Description: Stapf 1920 (655), Chippindall & Crook 1976 (33), Chippindall 1955 (329), Clayton et al. 1970–1982 (471). Voucher: De Winter 9167, Godfrey SH 1709. PRECIS code 9901160–02800.

Panicum merkeri Mez

(=*P. radula* Mez)

Perennial; stout, shortly rhizomatous and tufted (erect); to 1600 mm tall. Leaf blades to 350 mm long; 7–15 mm wide. Spikelets 2.0–2.5 mm long. Plant generally hispid; lower glume 1/4–1/3 the length of the spikelet; upper glume and lower lemma 9 (–11)-nerved; lower floret male with the palea well developed; female-fertile (upper) floret pale and shiny.

Swamps and seasonally damp places in heavy clay soils. Infrequent. Biome: Savanna. Reported from Namibia, Angola and north to east Africa. No specimen definitely referred to this species has been seen, but it belongs to the *P. coloratum* – *P. stapfianum* complex which needs study.

Description: Clayton et al. 1970–1982 (486). Voucher: photo of type of *P. radula*, Morgenstein (B). PRECIS code 9901160–02850.

Panicum monticola Hook. f.

Perennial; trailing, decumbent, rooting at the nodes; culms 300–1000 mm long. Leaf blades to 150 mm long; (5–)10–25 mm wide. Spikelets 2.2–3.5 (–4.0) mm long. Inflorescence sparsely and irregularly branched, exerted from the uppermost leaf; lower glume broadly ovate, 1/4–1/2 the spikelet length, 0–1-nerved; upper glume and lower lemma



Fig. 151. Pl. 139.

5-nerved; lower floret sterile with the palea absent or rudimentary; female-fertile (upper) lemma pale, smooth and shiny.

Flowering January, April and June. In the shade of forests. Rare (in the FSA area). Biome: Forest. Throughout tropical Africa.

Description: Clayton et al. 1970–1982 (494). Voucher: Scheepers 399. PRECIS code 9901160–03000.

Panicum natalense Hochst.

(=*P. fulgens* auctt., non Stapf) 3.

Natal buffalo grass, Natal-buffelsgras.

Perennial; shortly rhizomatous and tufted (densely); to 500 (–800) mm tall. Leaf blades to 500 mm long; to 3.5 mm wide. Spikelets 1.7–2.2 mm long. Plant base knotty, leaves mainly basal, tightly folded or flat; spikelets nearly rounded in outline; lower glume 1/2–3/4 the spikelet length; upper glume and lower lemma 5-nerved; lower floret male or sterile, the palea membranous, well developed or reduced in width only, not longer than the lemma; female-fertile (upper) lemma pale, sparsely to densely papillose.

Flowering October to April. Sandy loam or sandy soils in well drained or shallow soils in rocky areas, often in burnt veld. Infrequent to common. Biome: Savanna and Grassland. Angola and Zimbabwe. Pasture (normally only grazed in spring after burning). A few specimens in the Transvaal may represent a new species (eg. Codd 2736). They have longer rhizomes and the plants are more loosely tufted and the leaves are not basal, but cauline.

Description: Chippindall & Crook 1976 (40), Stapf 1898–1900 (412), Chippindall 1955 (333). Voucher: Smook 1154, Smook 5005. PRECIS code 9901160–03100.

Panicum novemnerve Stapf

Annual; loosely tufted (geniculate); to 600 mm tall. Leaf blades to 200 mm long; to 15 mm wide. Spikelets 2.0–2.5 mm long. Bulbous-based hairs at least on the leaf sheaths; inflorescence extends beyond the tip of the uppermost leaf, but the base is enclosed in the uppermost leaf, broadly ovate, branches long, flexuous, spreading, densely scabrid with prickles that are 0.10–0.15 mm long just below the spikelets; lower glume to 2/3 the length of the spikelet; upper glume and lower lemma (7–)9-nerved; lower floret sterile with the palea conspicuously reduced; female-fertile (upper) floret pale to dark, smooth and shiny.

Flowering December to April. Moist clayey loams, brackish soils along drainage lines and in depressions where water collects. Infrequent. Biome: Savanna. Southern tropical Africa. Barely distinguishable from *P. arcurameum* and a detailed study is needed. Resembles *P. atrosanguineum*, which has the inflorescence branches only moderately scabrid with prickles.

Description: Stapf 1920 (702), Chippindall & Crook 1976 (39), Chippindall 1955 (327). Voucher: Freyer 36. PRECIS code 9901160–03200.

Panicum obumbratum Stapf

Perennial; trailing, prostrate base, rooting at nodes; culms to 500 mm long. Leaf blades to 40 mm long; 3–6 mm wide. Spikelets 4 mm long. Inflorescence narrow, sparsely branched with few spikelets; lower glume 1/3 the length of the spikelet; upper glume 7-nerved; lower floret

male, the lemma 5-nerved, the palea well developed; female-fertile (upper) lemma minutely transversely rugose.

Flowering December to January. Shady places around streams and forests. Rare. Biome: Forest. Endemic. Resembles *Brachiaria chusqueoides*, which has pseudopetiolate leaves.

Description: Stapf 1898–1900 (401), Chippindall 1955 (326). Voucher: Acocks 17887. PRECIS code 9901160–03300.

Fig. 152. Pl. 140.



Fig. 152. *Panicum natalense*

***Panicum parvifolium* Lam.**

Perennial; scrambler and hydrophyte (rooting at lower nodes); culms 80–500 mm long. Leaf blades (13–)15–30 mm long; 2–7 mm wide. Spikelets 1–2 mm long. Leaves often reflexed at maturity, lanceolate to narrowly ovate, acute, base cordate; inflorescence small, 10–50 mm long, open, often barely exerted from the uppermost leaf sheath; lower glume 1/2–2/3 the length of the spikelet, glume tips not recurved; upper glume and lower lemma 5-nerved; lower floret usually male, the palea well developed; female-fertile (upper) lemma pale, smooth and shiny.

Flowering December to June. Organically rich sandy soils in water or along streams or in swamps. Infrequent. Biome: Grassland and Forest. Throughout tropical Africa, and in Madagascar and tropical America. Resembles *P. subflabellatum*, which has longer leaves (30–70 mm long) and a shorter lower glume (1/3 the length of the spikelet).

Description: Stapf 1920 (726), Chippindall 1955 (325), Clayton et al. 1970–1982 (490). Voucher: Acocks 13340. PRECIS code 9901160–03500.

***Panicum pilgerianum* (Schweick.) Clayton**

(=*Acroceras pilgerianum* Schweick.) 2; (= *Psilochloa pilgerana* (Schweick.) Laurent) 4.

Annual; hydrophyte and tufted; to 2000 mm tall. Leaf blades to 320 mm long; to 10 mm wide. Spikelets 4.5–6.0 mm long. Inflorescence branches ascending, with large spikelets densely appressed to the branches; upper glume 9-nerved; lower floret sterile or male, or both on the same inflorescence, the lemma 7-nerved, the broadest interspaces between the nerves are adjacent to the central nerve, and the palea well developed or slightly shorter and narrower; female-fertile (upper) lemma pale, dull, with a rough surface.

Flowering February to June. Growing in clay soils, in water of dams and pans, also in vleis. Locally common. Biome: Savanna. Endemic. *Psilochloa* has been placed in synonymy with *Panicum* since the characters on which it is based do not separate it from the large genus *Panicum*.

Description: Chippindall 1955 (386). Voucher: Smith 1899. PRECIS code 9901160–03750.

***Panicum repens* L.**

Couch panicum, kruitgras.

Perennial; occasional hydrophyte, rhizomatous, and tufted (erect to decumbent, sometimes floating); to 1000 mm tall. Leaf blades 70–250 mm long; 2–8 mm wide. Spikelets 2–3 mm long. Leaves mainly cauline, distichous, ascending, usually pungent; inflorescence narrowly oblong, sparsely to moderately branched, usually ascending; lower glume broadly ovate, to 1/2 the length of the spikelet; upper glume and lower lemma 7–9-nerved; lower floret usually male, the lemma with the broadest interspaces between nerves not confined to adjacent to the central nerve, the palea well developed; female-fertile (upper) lemma pale to yellowish, shiny.

Flowering October to June. Wet sandy soils, sometimes in either fresh or brackish water. Locally common. Biome: Fynbos, Savanna, Grassland, and Desert. Throughout tropics and subtropics. Pasture (grazed by game and domestic livestock in Botswana), or erosion control (planted around dams in Zimbabwe).

Description: Stapf 1920 (708), Chippindall & Crook 1976 (38), Chippindall 1955 (333), Clayton et al. 1970–1982 (481). Illustration: Clayton et al. 1970–1982 (fig. 121). Voucher: Smook 4211. PRECIS code 9901160–03800.

***Panicum repentellum* Napper**

Perennial (to subperennial); hydrophyte, rhizomatous, and stoloniferous (erect or decumbent); to 600 mm tall. Leaf blades 50–120 mm long; 3–5 mm wide. Spikelets 2.0–3.5 mm long. Slender leaves mainly cauline; inflorescence closely associated with uppermost leaf, narrow and sparsely branched, ascending; lower glume broadly ovate; upper glume and lower lemma 7-nerved; lower floret usually male, the lemma with the broadest interspaces of the nerves adjacent to the central nerve, and the palea well developed; female-fertile (upper) lemma pale, shiny.

Flowering January to May. Black or grey soils around vleis and lakes or in water. Infrequent. Biome: Savanna. Malawi, Zambia, Zaire to east Africa, Ethiopia and Sudan.

Description: Clayton et al. 1970–1982 (482). Voucher: Chippindall 346, Smith 3812. PRECIS code 9901160–03850.

***Panicum schinzii* Hack.**

(=*P. laevifolium* Hack. var. *laevifolium*) 3.

Land grass, blousaadgras.

Annual; tufted (erect to sprawling, occasionally rooting at the nodes); to 900 mm tall. Leaf blades to 300 mm long; to 20 mm wide. Spikelets 2.0–2.5(–3.5) mm long. Lower sheaths glabrous or sparsely hairy at the extreme base, leaves dark green; inflorescence well exerted from the uppermost leaf, open, oblanceolate to narrowly obovate, profusely branched with many spikelets; spikelets blunt; tips of the glumes not recurved; lower glume broadly ovate; upper glume and lower lemma 9–11-nerved; lower floret male or both male and sterile occurring in the same inflorescence, the palea well developed; female-fertile (upper) lemma pale to yellow, shiny.

Flowering November to May. Moisture loving, in sandy and clay soils of seepage areas, depressions where water collects and in cultivated lands. Common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Zimbabwe and Mozambique. Good hay, palatable pasture and weed (of cultivated lands). Resembles *P. sp. 2*, which is yellowish green, with inflorescence obovate to broadly obovate, spikelets acute and occurs in northern Namibia; also *P. subalbidum*, which has appressed spikelets and palea of the lower floret conspicuously reduced in length.

Description: Chippindall 1955. Voucher: Smook 3163, Galpin 401. PRECIS code 9901160–03900.

***Panicum stapfianum* Fourc.**

Perennial; tufted; to 900 mm tall. Leaf blades to 400 mm long (but usually shorter); to 5 mm wide. Spikelets to 3 mm long. Plants with bulbous-based hairs present or absent, leaves mainly basal, upper leaf surface usually densely papillate; lower glume 1/2–2/3 the length of the spikelet; upper glume and lower lemma 7–9-nerved; lower floret male with the palea well developed; female-fertile (upper) lemma pale yellow to flushed greyish, smooth.

Flowering November to May. Damp area on heavy or sandy soils, disturbed or calcareous areas and occasionally rocky dry areas. Locally common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Endemic. Highly palatable pasture. Part of the *P. coloratum*-*P. stapfianum* complex, which also includes *P. bechuanense* and *P. merkeri*. Detailed study of species limits is needed.

Description: Chippindall 1955 (336). Illustration: Muller 1984 (fig. 102), Chippindall 1955 (fig. 293). Voucher: Smook 2357. PRECIS code 9901160-04000.

Panicum subalbidum Kunth

(=*P. glabrescens* Steud.) 3.

Elbow buffalo grass.

Shortlived perennial, or annual; hydrophyte (occasionally), or tufted (erect to decumbent and rooting at the nodes); to 2000 mm tall. Leaf blades 200–500 mm long; 6–18 mm wide. Spikelets 2.5–3.5 mm long. Plant slender to robust; upper leaf surface with large, usually white prickles always visible on the upper leaves, papillae sometimes present; inflorescence sparsely to moderately branched with spikelets appressed to the branches; spikelets acuminate; lower glume broadly ovate, to 1/3 the length of the spikelet; upper glume and lower lemma 7–9-nerved; lower floret sterile with the palea absent or poorly developed; female-fertile (upper) lemma pale to yellowish, shiny.

Flowering October to April. Usually on clay soils in disturbed areas, in or near water, along rivers and swamps. Infrequent. Biome: Savanna and Grassland. Throughout tropical Africa. This species is very variable in size. It resembles *P. impeditum*, which has papillae only, and lacks prickles on the upper leaf surface.

Description: Chippindall & Crook 1976 (48), Chippindall 1955 (333), Clayton et al. 1970–1982 (484). Voucher: Smith 1438, Theron 1978. PRECIS code 9901160-04050.

Panicum subflabellatum Stapf

Perennial; sometimes shortly rhizomatous, stoloniferous, and tufted (erect or decumbent); to 500 mm tall. Leaf blades 30–70 mm long; 2–3 mm wide. Spikelets 1.3–1.7 mm long. Lower leaf sheaths glabrous, leaves not reflexed, linear-lanceolate, tapering to a long acuminate tip, base straight; inflorescence moderately branched, 10–60 mm long; spikelets spherical, strongly flushed with purple; glume apex not recurved; lower glume 1/3 the length of the spikelet, broadly ovate; upper glume 5-nerved; lower floret usually male, lemma 5–7-nerved, and the palea well developed; female-fertile (upper) lemma pale, shiny or dull.

Flowering December and March. Sand dunes and swampy areas along coast. Locally common. Biome: Savanna. Mozambique and Tanzania. Resembles *P. parvifolium*, which has shorter leaves (15–30 mm long) and a longer lower glume (1/2–2/3 the length of the spikelet).

Description: Stapf 1920 (711), Clayton et al. 1970–1982 (481). Voucher: Ward 8822. PRECIS code 9901160-04100.

Panicum trichonode Launert & Renvoize

Perennial; shortly rhizomatous and tufted (densely, erect or occasionally geniculate); to 900 mm tall. Leaf blades 100–300 mm long; 2–6 mm wide. Spikelets (2.0–)2.5–3.0 mm long. Plants not appearing leafy, leaves mainly cauline, upper leaf surface densely papillate; culm nodes densely covered with short appressed hairs; lower portion

of plant usually strongly flushed with purple; inflorescence moderately branched, ascending, lower part of the branches naked for a distance below the spikelets; lower glume broadly ovate, to 1/4 the length of the spikelet; upper glume and lower lemma 9–11-nerved; lower floret male with the palea well developed; female-fertile (upper) lemma pale to yellow, shiny.

Flowering January to May. Black clays or sand in seasonally flooded areas, vleis and pan edges. Infrequent. Biome: Savanna. Zambia. Domestic use (thatching).

Description: Launert 1970 (160:138). Voucher: Rodin 9098. PRECIS code 9901160-04300.

Panicum volutans J.G. Anders.

Rolling grass, tumble weed.

Annual; loosely tufted (erect to decumbent and rooting at the nodes); to 750 mm tall. Leaf blades 230 mm long; 0.5–10.0 mm wide. Spikelets (5.5–)6.0–6.5 (–7.0) mm long. Leaves hispid with bulbous-based hairs; inflorescence large, open, spreading and extending beyond the tip of the uppermost leaf while the base is often enclosed in uppermost leaf, branches naked for long distance before the 1–3 spikelets at the tips; spikelets long-acuminate; upper glume 7–9-nerved; lower floret sterile, lemma 7-nerved, and the palea reduced; female-fertile (upper) lemma yellowish grey with very conspicuous nerves.

Flowering January to March. Mainly in black turf in cultivated and disturbed areas and areas of high moisture. Locally common. Biome: Savanna, Grassland. Endemic. Chippindall (1955) treated this species as *P. sp. aff. P. hippothrix* K. Schum. It is the only *Panicum* species in the FSA area in which the whole inflorescence breaks off at maturity and is rolled about by the wind.

Description: Anderson 1960 Bothalia 7 (420), Chippindall 1955 (328). Voucher: Scheepers 1478. PRECIS code 9901160-04400.

Panicum sp. 1 (=Smook 3463)

Annual; tufted (often geniculate); 150–180 mm tall. Leaf blades to 120 mm long; 3–6 mm wide. Spikelets 2.4–2.8 mm long. Plant often flushed with purple; inflorescence always exerted out to one side of the uppermost leaf, shorter or longer than the leaf tip, moderately branched, branches appressed, ascending; spikelets appressed to the inflorescence branches; lower glume broadly ovate, to 1/3 the length of the spikelet; upper glume and lower lemma 9–11-nerved; lower floret always sterile with the palea either well developed or only slightly reduced in width; female-fertile (upper) lemma pale yellow to dark, shiny.

Flowering November to April. Moist soils around vleis, dams, pans, and depressions, and in disturbed areas. Locally common. Biome: Grassland and Nama-Karoo. Endemic. Resembles *P. gilvum* and *P. impeditum*, which have the palea of the lower floret greatly reduced in length and width.

Voucher: Smook 3463. PRECIS code 9901160-99999.

Panicum sp. 2 (=Giess 8605)

Annual; tufted (erect, sometimes geniculate); to 1200 mm tall. Leaf blades 100–250 mm long; 5–15 mm wide. Spikelets 2.2–2.8 mm long. Plant yellowish green, lower sheaths glabrous to sparsely hairy; inflorescence obovate to broadly obovate, open, profusely branched, well exerted



from the uppermost leaf; spikelets acute, often strongly flushed with purple; lower glume ovate; upper glume usually with small recurved mucro at the tip; upper glume and lower lemma 7–9-nerved; lower floret always male with the palea usually well developed, occasionally slightly reduced in length; female-fertile (upper) lemma pale to yellow to dark brown.

Flowering February to May. Moist sand to clayey loams (often overlaying calcrete) around vleis, pans, and dams and often in disturbed moist areas. Locally common. Biome: Savanna. Endemic. Resembles *P. schinzii*, which probably does not occur in Namibia, but is usually green, with the inflorescence oblanceolate to narrowly obovate, and the spikelets blunt-tipped. The plants assigned to this new taxon have previously been referred to *P. novemnerve*, which has the palea of the lower floret poorly developed. Until further study, these specimens will be kept as a separate entity.

Voucher: Giess 10799, Giess 8605. PRECIS code 9901160–99999.

Parapholis C.E. Hubb.

Lepidurus Janchen.

Annual (erect or more or less prostrate); caespitose. Culms 20–500 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat, or rolled (convolute). *Ligule* an unfringed membrane.

Inflorescence a single spike (cylindrical); espatheate. Spikelet-bearing axes disarticulating at the joints.

Spikelets solitary; distichous; 4–7 mm long; compressed laterally; falling with the glumes (shed with rachis joints). Glumes two; more or less equal; displaced (abaxial, side by

side); awnless; similar (leathery). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas less firm than the glumes (membranous, side-on to the rachis); 3 nerved (the laterals very short); awnless. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7, 9$, and 19. Pooideae; Poodae; Poaceae. 6 species. Western Europe, Mediterranean to India. Maritime-arenicolous to halophytic, or glycophytic. Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by G.E. Gibbs Russell.

Parapholis incurva (L.) C.E. Hubb.

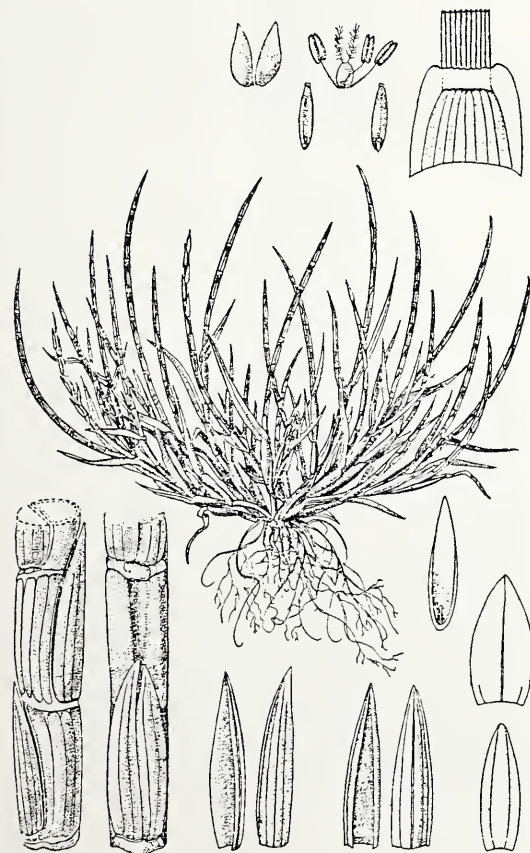
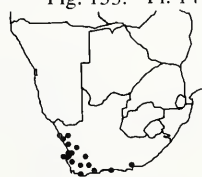
Fig. 153. Pl. 141.

Annual; culms erect or decumbent; 60–300 mm tall. Leaf blades inconspicuous, to 30 mm long; 1.5–2.0 mm wide. Spikelets 4.5–5.5 mm long. Spikes cylindrical, solitary, usually curved; the two glumes lying side by side, keel not winged.

Flowering August to October.

Weedy at roadsides and in moist places. Infrequent. Naturalized from Europe. Biome: Fynbos. Widely introduced in temperate areas. Weed. Similar to *Hainardia cylindrica*, which has a single glume.

Description: Tutin 1980 Fl. Europ. 5 (243), Chippindall 1955 (73). Voucher: Acocks 17786. PRECIS code 9904431–00100.



Paratheria Griseb.

Perennial; geniculate ascending, rooting at the nodes. Culms 150–800 mm high; herbaceous; branched above. Leaf blades linear; flat. *Ligule* a fringed membrane (very narrow), or a fringe of hairs. Plants with hermaphrodite florets. The spikelets all alike in sexuality (but sometimes with cleistogamous spikelets lacking bristles at the base of the inflorescence). Plants with hidden cleistogenes (in the upper sheaths).

Inflorescence paniculate; contracted; espatheate. Spikelet-bearing axes disarticulating; falling entire (i.e., the lateral branch disarticulates, carrying with it the spikelet and bristle, and constituting a pointed callus beneath the spikelet).

Spikelets (at least some of them) subtended by solitary 'bristles'; solitary (and 1 spikelet per branch). Spikelets 8–13 mm long; abaxial; compressed dorsiventrally; falling with the glumes (and the branch). Glumes two; minute; more or less equal; awnless; similar (hyaline). Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; smooth; not becoming indurated; hairless; having the margins lying flat and exposed on the palea; without a germination flap; 7 nerved; entire; awnless (but acuminate-subulate, like the L1). Palea present; relatively long (about equalling the lemma). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Photosynthetic pathway. C₄; XyMS–.

Cytology, classification, distribution. Panicoideae; Panicoideae; Paniceae. 2 species. Africa, Madagascar, Cuba, Brazil. Hydrophytic, or helophytic; in open habitats (swamps and lakes); glycophytic. Namibia. 1 indigenous species.

References. 1. Launert. 1970. FSWA.

Species treatment by H.M. Anderson.

Fig. 153. *Parapholis incurva*

Paratheria prostrata Griseb.

Perennial; tufted; 150–450 mm tall. Leaf blades 20–60 mm long; 2–4 mm wide. Spikelets about 9 mm long; 1 mm wide. Culm nodes bearded; spikelet with a little tuft of hairs at base and a single bristle 20 mm long; the spikelet and bristle disarticulate with the lateral branch which becomes a pointed callus beneath the spikelet.

Flowering December to January. Growing in and near water. Infrequent. Biome: Savanna. Tropical west Africa, Cuba, Brazil and Madagascar.

Description: Clayton 1972 FTWA (457), Launert 1970 (160:143). Voucher: De Winter 4049. PRECIS code 9901420–00100.



Pl. 142.

Paspalidium Stapf

Somewhat marginally separable from *Setaria* P. Beauv.

Annual, or perennial (often aquatic); long-rhizomatous, or caespitose to decumbent. Culms herbaceous. *Nodes glabrous*. Leaf blades flat, or rolled. *Ligule a fringed membrane (very narrow), or a fringe of hairs*.

Inflorescence of spike-like main branches (the branches generally appressed to the rachis, and sometimes greatly reduced); espatheate. Spikelet-bearing axes persistent.

Spikelets unaccompanied by bractiform involucre, not associated with setiform vestigial branches (this being the 'distinction' from Setaria; however, the terminal spikelet of each branch is associated with the branch-tip bristle, and since the 'branches' may be reduced to single spikelets, the separation is scarcely adequate); solitary, or in pairs; biseriate. Spikelets abaxial; compressed dorsiventrally; falling with the glumes. Glumes two; very unequal; awnless. Proximal incomplete florets 1; paleate, or epaleate, palea when present fully developed to reduced; male, or sterile.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; rugose; becoming indurated (crustaceous); hairless; having the margins tucked in onto the palea; with a clear germination flap; 5 nerved; entire; awnless (often apiculate). Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; ellipsoid to subglobose; hilum short; embryo large.

Photosynthetic pathway. C₄; XyMS–. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicoideae; Paniceae. About 40 species. In warm regions. Hydrophytic to mesophytic; in shade and in open habitats (swamps, forests, dry slopes); glycophytic. Namibia, Botswana, Transvaal, Natal, and Lesotho. 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Spikelets 1.6–2.6 mm long, ovate; central axis of inflorescence 0.5–1.0 mm wide, narrowly winged; leaf blades setaceous acuminate. **P. geminatum** Spikelets 3.0–3.5 mm long, narrowly ovate; central axis of inflorescence 3–5 mm wide, broadly winged and ribbon-like; leaf blades bluntly acute to broadly obtuse and then often notched at the apex and splitting along the midrib **P. obtusifolium**

Fig. 154. *Paspalidium obtusifolium***Paspalidium geminatum** (Forssk.) Stapf

Perennial; hydrophyte and rhizomatous (rhizome floating and spongy), or stoloniferous (culms prostrate and rooting at the nodes); 100–600 mm tall. Leaf blades 50–350 mm long; 2–13 mm wide. Spikelets 1.6–2.6 mm long. Leaf blades acuminate; central axis of inflorescence narrowly winged, 0.5–1.0 mm wide; spikelets ovate.

Flowering March to June. In water up to 2 m deep but also extending to wet marshy soils on the edges of rivers, pans or vleis. Infrequent to locally common. Biome: Savanna, Grassland, and Nama-Karoo. Old world tropics. Easily distinguished from *P. obtusifolium*, which has larger spikelets and blunt leaf tips.



Description: Stapf 1920 (582), Chippindall 1955 (366), Clayton et al. 1970–1982 (552). Illustration: Clayton et al. 1970–1982 (fig. 133). Voucher: Leistner, Oliver, Steenkamp & Vorster 253, Giess 3132. PRECIS code 9901090–00100.

***Paspalidium obtusifolium* (Del.) Simpson**

(=*P. platyrrhachis* C.E. Hubb.) 2.

Fig. 154. Pl. 143.



Perennial; hydrophyte and rhizomatous (rhizome floating and spongy), or stoloniferous (culms prostrate and rooting at the nodes); 300–600 mm tall. Leaf blades 30–200 mm long; 4–12 mm wide. Spikelets 3.0–3.5 mm long. Leaf blades bluntly acute to broadly obtuse, often notched at the rounded apex and splitting along the midrib; central axis of inflorescence broadly winged and ribbon-like, 3–5 mm wide; spikelets acute and narrowly ovate.

Flowering September to May. On marshy soils or shallow water in pans, often with culms floating. Infrequent to locally common. Apparently indigenous, but possibly brought from Egypt by waterbirds. Biome: Savanna. Northwards to Algeria and Egypt. Easily distinguished from *P. geminatum*, which has smaller spikelets and acuminate leaf tips. Vegetatively similar to *Stenotaphrum secundatum*, which is not aquatic and has minute spikes sunk in the rachis.

Description: Chippindall 1955 (366), Clayton et al. 1970–1982 (551). Illustration: Chippindall 1955 (fig. 315). Voucher: Davidse 5868. PRECIS code 9901090–00200.

***Paspalum* L.**

Anachyris Nees, *Cereia* Schlecht., *Ceresia* Pers., *Cleachne* Roland. ex Rottb., *Cymotochloa* Schlecht., *Dichromis* Schlecht., *Digitaria* Fabric., *Dimorphostachys* Fourn., *Maizilla* Schlecht., *Moenchia* Steud., *Paspalanthium* Desv., *Reimaria* Fluegge, *Sabsab* Adans., *Wirtgenia* Doell.

Perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 100–3000 mm high (rarely taller, sometimes with culms trailing to 2 m or more); herbaceous. Leaf blades linear, or linear to linear-lanceolate; flat, or folded, or rolled. Ligule an unfringed membrane to a fringe of hairs. Plants bisexual, with bisexual spikelets.

Inflorescence of spike-like main branches; digitate or subdigitate, or non-digitate; espatheate. Spikelet-bearing axes disarticulating (e.g., *P. repens*), or persistent; when disarticulating falling entire.

Spikelets biseriate; consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations. Spikelets (1.2–)1.5–4.2(–4.5) mm long; abaxial; compressed dorsiventrally; falling with the glumes; awnless, mucous. Glumes present (usually), or absent (in Section *Anachyris*); when present one per spikelet (in species with an 'andropogonoid' spikelet arrangement), or two; very unequal; awnless; very dissimilar (G1 usually much reduced). Lower glume 0–1 nerved. Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas similar in texture to the glumes, or decidedly firmer than the glumes (papery to crustaceous); smooth to striate; becoming indurated, or not becoming indurated; hairless; having the margins tucked in onto the palea; with a clear germination flap; 3–5 nerved; entire; blunt; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large, or small (rarely).

Photosynthetic pathway. C₄; NADP-ME (*notatum*, *dilatatum*); XyMS–. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 10$ and 12. Panicoideae; Panicoideae; Paniceae. 320 species. In warm regions. Mostly helophytic, or mesophytic, or xerophytic; mostly in open habitats (diverse habitats — savanna, damp places, forest margins, weedy ground, coastal and inland saltmarshes); maritime-arenicolous (a few — *P. vaginatum* being a useful sand stabilizer), or halophytic (e.g. *P. distichum*), or glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (3), naturalized species (3).

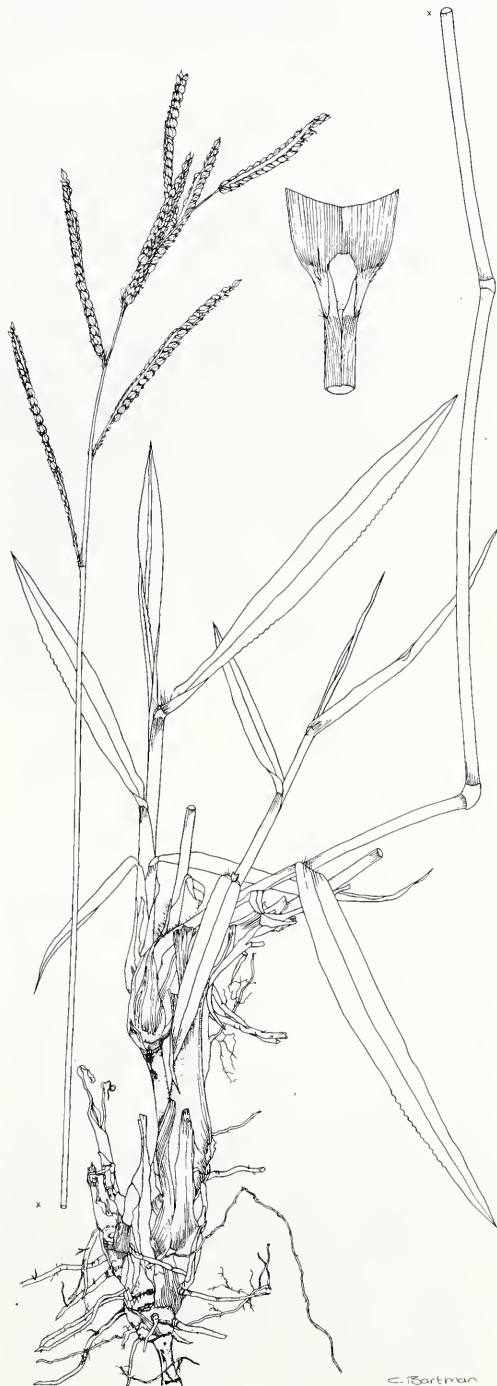


Fig. 155. *Paspalum dilatatum*

References. 1. De Winter & Vorster. 1974. *Bothalia* 11: 295. 2. Clayton & Renvoize. 1982. *FTEA*. 3. Clayton & Renvoize. 1980. *Taxon* 29: 337. 4. Webster. 1987. *The Australian Paniceae* (Poaceae).

Species treatment by M. Koekemoer.

- 1(0). Spikelets hairy or fringed with hairs, matt, arranged in four rows on one side of the rachis 2
Spikelets glabrous or minutely hairy on the body, usually glossy, arranged in two rows on one side of the rachis 3
2(1). Spikelets longer than 3 mm; racemes 4–9, scattered on a central axis 30–200 mm long; basal sheaths glabrous or sparsely hairy *P. dilatatum*
Spikelets shorter than 3 mm; racemes 10–30, closely arranged on a central axis 120–300 mm long; basal sheaths densely hairy *P. urvillei*
3(1). Spikelet tips rounded; spikelets ovate to elliptic, 1.0–1.5 times as long as wide 4
Spikelet tips acute; spikelets broadly lanceolate, more than 2 times longer than wide 5
4(3). Spikelets 2.8–3.7 mm long; rachis often zig-zag, about half the width of the raceme; rhizome very well developed and horizontally creeping
..... *P. notatum*
Spikelets 2.0–2.5 mm long; rachis flat and linear, almost leaf-like, as wide as the raceme; rhizome short and not horizontally creeping
..... *P. scrobiculatum*
5(3). Lower glume usually developed as a small triangular scale or up to half the spikelet length; upper glume minutely hairy; leaves more than 3 mm wide; spikelets 2.5–3.5 mm long, narrow obovate
..... *P. distichum*
Lower glume absent or reduced to a rim; upper glume glabrous; leaves less than 3 mm wide; spikelets 3.0–4.5 mm long, almost lanceolate
..... *P. vaginatum*

Paspalum dilatatum Poir.

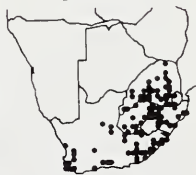
Dallis grass, gewone paspalum, watergras.

Perennial; rhizomatous (rhizome short and creeping), or tufted; 300–1800 mm tall. Leaf blades 90–350(–450) mm long; 6–14 mm wide. Spikelets 3–4 mm long; 2.0–2.5 mm wide. Basal sheaths glabrous or sometimes hairy; ligule conspicuous, membranous, 2–8 mm long; inflorescence with central axis 30–200 mm long; racemes 4–9, scattered on axis; spikelets fringed with white hairs and arranged in four rows on one side of the rachis.

Flowering October to May. Usually in damp places, most often in disturbed areas such as roadsides, gardens and cultivated lands. Common. Naturalized from South America. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Tropics worldwide. Pasture (widely used as fodder or leys), or erosion control (stabilization of minedumps), or weed (common invader). Resembles *P. urvillei*, which has more racemes and smaller spikelets.

Description: Webster 1987 (172), Chippindall & Crook 1976 (12), Hitchcock & Chase 1950 (590), Chippindall 1955 (387), Clayton et al. 1970–1982 (608). Illustration: Chippindall 1955 (pl. 13(II)), Hitchcock & Chase 1950 (fig. 1244). Voucher: Smook 4134. PRECIS code 9901070–00100.

Fig. 155. Pl. 144.



Paspalum distichum L.

(=*P. paspalodes* (Michx.) Scribn.).

Couch paspalum, bankrot-kweek.

Perennial; hydrophyte (rooting at the nodes), or rhizomatous, or stoloniferous (mat-forming); 100–300 mm tall. Leaf blades 20–220 mm long; 3–8 mm wide. Spikelets 2.5–3.5 mm long; 1.3–1.5 mm wide. Racemes usually two; spikelets arranged in two rows, glabrous, lanceolate, tips acute; lower glume usually developed into a small triangular scale or sometimes absent.

Flowering November to May. Always in or near salt or fresh water on river banks, in vleis and along pan edges in muddy soil, sand or black turf. Locally common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Tropics worldwide. Weed (pest in lands, difficult to eradicate). Closely related to *P. vaginatum*, in which the lower glume is absent or reduced to a rim, the upper glume glabrous and the leaves less than 3 mm wide. Conflicting opinions exist about the nomenclature and status of these two species but leaf anatomical differences were found by Ellis (1974 *Bothalia* 11: 235).

Description: Stapf 1898–1900 (371), Chippindall 1955 (389). Illustration: Chippindall 1955 (fig. 331). Voucher: Jacobsz 4003, Smook & Gibbs Russell 2242. PRECIS code 9901070–00150.

Paspalum notatum Fluegge

Bahia grass, Bahia paspalum.

Perennial; long rhizomatous and tufted (often decumbent); 100–600 mm tall. Leaf blades 60–240 mm long; 4–10 mm wide. Spikelets 2.8–3.7 mm long; 2.0–2.8 mm wide. Rhizome well developed, almost woody, clad in overlapping leaf sheaths; racemes 2 (occasionally 3), 25–130 mm long; rachis often zig-zag; spikelets glabrous, glossy, tips rounded, more than 1.5 times longer than wide and arranged in two rows.

Flowering November to April. In high rainfall areas on sandy or clayey soil, often in disturbed places and cultivation. Infrequent. Naturalized from South America. Biome: Fynbos and Grassland. Tropical Africa and tropical America. Pasture (fodder, not extensively cultivated, improved stains used for fodder for sheep), or erosion control (binding soil on bench terraces), or weed (tough and aggressive invader of cultivation and disturbed areas). Closely related to *P. scrobiculatum*, which has smaller spikelets and a flat, almost leaf-like rachis.

Description: Webster 1987 (176), Chippindall & Crook 1976 (13), Hitchcock & Chase 1950 (583), Chippindall 1955 (389), Clayton et al. 1970–1982 (609). Illustration: Hitchcock & Chase 1950 (fig. 1214). Voucher: Mogg 35370. PRECIS code 9901070–00200.

Paspalum scrobiculatum L.

(=*P. commersonii* Lam.) 2;
(=*P. orbiculare* Forst.) 2; (= *P. polystachyum* R. Br.) 2.

Creeping paspalum, dronk-gras.

Perennial; hydrophyte (occasionally), or rhizomatous (short-



ly), or stoloniferous (sometimes), or tufted (loosely, erect or decumbent); 100–700 mm tall. Leaf blades 150–200(–380) mm long; 6–8(–10) mm wide. Spikelets 2.0–2.5 mm long; 1.8–2.4 mm wide. Racemes 1–5, 30–80(–150) mm long; rachis linear and almost as wide as the raceme; spikelets glabrous, ovate, arranged in two rows.

Flowering September to May. Moist, semi-swampy areas or on fertile well-drained soils, often in disturbed places and abandoned lands. Locally common. Biome: Fynbos, Savanna, and Grassland. Old world tropics and subtropics. Food and drink (domesticated as cereal in India), or pasture (palatable fodder but seedheads subject to ergot infection), or poisonous (when infected with ergot), or weed (ruderal in damp areas). Closely related to *P. notatum*, which has larger spikelets, a narrower rachis and a very well developed rhizome.

Description: Stapf 1919 (573), Chippindall & Crook 1976 (14), Stapf 1898–1900 (370), Hitchcock & Chase 1950 (601), Chippindall 1955 (387). Illustration: Chippindall 1955 (fig. 330), Clayton et al. 1970–1982 (fig. 142). Voucher: Smook 1006. PRECIS code 9901070–00550.

Paspalum urvillei Steud.

Vasey grass, langbeen paspalum.

Perennial; rhizomatous and tufted (coarsely and erect); 100–2500 mm tall. Leaf blades 250–600 mm long; 4–15 mm wide. Spikelets 1.6–2.8 mm long; 1.2–1.4 mm wide. Basal sheaths densely hairy; ligule conspicuous, membranous, 2–9 mm long; inflorescence with central axis 120–300 mm long; racemes 10–30, closely spaced on axis; spikelets arranged in four rows, fringed with white hairs to give a woolly appearance.

Flowering October to April. Near water or in moist places, along water furrows, roadsides and streambanks on sandy loam. Common. Naturalized from South America. Biome: Fynbos, Savanna, and Grassland. Tropics worldwide. Domestic use (old inflorescences used as whisk brooms for brushing lint), or pasture (cultivated for hay; frost resistant, only occasionally susceptible to ergot, young growth palatable and nutritious, but stinky when old). Resembles *P. dilatatum*, which has larger spikelets and fewer racemes.

Description: Webster 1987 (181), Chippindall & Crook 1976 (15), Hitchcock & Chase 1950 (595), Chippindall 1955 (387). Illustration: Chippindall 1955 (pl. 13(I)), Hitchcock & Chase 1950 (fig. 1246). Voucher: Liebenberg 8769. PRECIS code 9901070–00600.

Paspalum vaginatum Swartz

Brak paspalum, seashore paspalum.

Perennial; hydrophyte (and then rooting at the nodes below the water level and branching above), or rhizomatous (shortly), or stoloniferous (mat-forming); 300–400(–600) mm tall. Leaf blades 40–90 mm long; 2–3(–4) mm wide. Spikelets 3.0–4.5 mm long; 0.9–1.5 mm wide. Internodes short, branching at most nodes; racemes usually two; spikelets arranged in two rows, glabrous, lanceolate with tips acute; lower glume absent or reduced to a rim.

Flowering December to April. Near coasts, in or near estuaries or rivers, also inland at water edges on sandy soils but most often in saline water. Locally common. Biome: Fynbos, Savanna, Grassland, and Desert. Worldwide in tropics and subtropics. Potential pasture (on some brak and

structureless soils), or erosion control (sand binder at coasts), or weed (in irrigation furrows and rice lands). Closely related to *P. distichum*, which has a lower glume developed into a small triangular scale or up to 1/2 the spikelet length and the upper glume minutely hairy. Conflicting opinions exist about the nomenclature and status of these two species, however leaf anatomical differences were found by Ellis (1974 *Bothalia* 11: 235).

Description: Stapf 1919 (570), Chippindall & Crook 1976 (16), Hitchcock & Chase 1950 (580), Chippindall 1955 (389), Clayton et al. 1970–1982 (609). Illustration: Hitchcock & Chase 1950 (fig. 1206). Voucher: Michelmores 162. PRECIS code 9901070–00700.

Pennisetum Rich.

Amphochaeta Anderss., *Beckeropsis* Fig. & de Not., *Catatherophora* Steud., *Eriochaeta* Fig. & de Not., *Gymnotrix* P. Beauv., *Loydia* Delile, *Macrochaeta* Steud., *Penicillaria* Willd., *Pentastachya* Steud., *Sericura* Hassk.

Annual (rarely), or perennial; long-stoloniferous, or caespitose, or decumbent. Culms 150–8000 mm high; herbaceous; branched above, or unbranched above. *Ligule a fringed membrane to a fringe of hairs. Plants with hermaphrodite florets.* The spikelets of sexually distinct forms on the same plant (peripheral spikelets of the glomerules may be male-only), or all alike in sexuality. Plants with hidden cleistogenes (e.g. *P. clandestinum*, which lacks 'normal' inflorescences), or without hidden cleistogenes.

Inflorescence a false spike, with clusters of spikelets on reduced axes, or paniculate (the spikelets fascicled in false spikes, in small groups or apparently solitary, but always surrounded at their bases by reduced-branch bristles); contracted (into false spikes); espatheate. Spikelet-bearing axes disarticulating (but the main axis persistent); falling entire (the false spikes or spikelet-plus-bristle clusters falling).

*Spikelets with 'involucres' of 'bristles' (these relatively slender, basally free or scarcely united, by contrast with *Cenchrus*). The 'bristles' relatively slender, not spiny. Female-fertile spikelets compressed dorsiventrally; falling with the glumes, or not disarticulating (in cultivated forms). Glumes two; very unequal (G1 often minute or vestigial); awnless; very dissimilar, or similar (hyaline or membranous). *Proximal incomplete florets* 1; paleate, or epaleate, palea when present fully developed to reduced; male, or sterile.*

Female-fertile florets 1. Lemmas similar in texture to the glumes, or decidedly firmer than the glumes; smooth, or striate; not becoming indurated (membranous to subcoriaceous); hairy (near the margins), or hairless (glabrous); having the margins lying flat and exposed on the palea; with a clear germination flap; 5–7 nerved; entire; awnless, or mucronate. Palea present; relatively long. Lodicles when present 2; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Photosynthetic pathway. C₄; NADP-ME (2 species); XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicodae; Paniceae. About 80 species. In warm regions. Helophytic, mesophytic, and xerophytic; in shade and in open habitats (savanna, woodland, weedy ground). Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. Indigenous species (8), naturalized species (4), cultivated species (1).

References. 1. Chippindall. 1955. Gr. & Past. 2. Brunken. 1977. Amer. J. Bot. 64: 161. 3. Clayton & Renvoize. 1982. FTEA.

Species treatment by H.M. Anderson.



Fig. 156. *Pennisetum spachelatum*

- 1(0). Inflorescence hidden in uppermost leaf sheath **P. clandestinum**
Inflorescence prominent 2
- 2(1). Inflorescence 200–500 mm by 30 mm; spikelet clusters borne on stalk 3–6 mm long . **P. glaucum**
Inflorescence less than 250 mm long; spikelet clusters not borne on a stalk 3
- 3(2). Inflorescence bristles 4–5 times as long as spikelet 4
Inflorescence bristles usually less than 2.5 times as long as spikelet 6
- 4(3). Inflorescence a compound panicle, branches filiform and usually in groups of 2–3; each spikelet subtended by a single bristle **P. unisetum**
Inflorescence not a compound panicle, spikelets subtended by about 30 bristles 5
- 5(4). Inflorescence bristles white, usually all plumose **P. villosum**
Inflorescence bristles purple, only inner ones plumose **P. setaceum**

- 6(3). Culms branched, often profusely 7
Culms not branched 9
- 7(6). Plants forming bamboo-like clumps up to 7500 mm tall; only inner bristles loosely plumose **P. purpureum**
Plants profusely branched, the tufts shorter than 1000 mm; all bristles either plumose or scabrid 8
- 8(7). Inflorescence lax; bristles plumose **P. foermerianum**
Inflorescence dense; bristles not plumose **P. mezinum**
- 9(6). Plants 1000–3000 mm tall; lowest leaf sheath with numerous short transverse veins; inflorescence 200–300 mm long; spikelet involucre with up to 30 bristles **P. glaucocladum**
Plants 200–2000 mm tall; lowest leaf sheath without numerous short transverse veins; inflorescence 50–250 mm long; spikelet involucre with up to 20 bristles 10
- 10(9). Most inflorescence bristles as long as spikelet, usually straw-coloured 11
Most inflorescence bristles longer than spikelet, straw-coloured to purple 12
- 11(10). Plants 800–2500 mm tall; inflorescence 120–250 mm long **P. macrourum**
Plants 400–900 mm tall; inflorescence 50–150 mm long **P. sphacelatum**
- 12(10). Plants 500–2000 mm tall; inflorescence 70–220 mm long; lower palea well developed; anther lobes without a minute tuft of hairs at apex **P. natalense**
Plants 200–800 mm tall; inflorescence 30–50 mm long; lower palea absent; anther lobes with a minute tuft of hairs at apex **P. thunbergii**

NOTE: *P. glaucocladum*, *P. macrourum*, *P. natalense*, *P. sphacelatum*, and *P. thunbergii* are all closely related and may therefore be difficult to key out.

Pennisetum clandestinum Chiov.

Kikuyu grass.

Perennial; rhizomatous and stoloniferous; 30–1200 mm tall. Leaf blades 50–300 mm long; 3–7 mm wide. Spikelets 10–20 mm long. Creeps vigorously by rhizomes and stolons; culms closely sheathed, with abundance of bright green leaves; inflorescence partly enclosed in uppermost leaf sheath; filamentous stigmas and the stamens with long filaments are clearly visible at flowering time. Flowering August to April. Requires high rainfall. Infrequent. Naturalized from the east African highlands. Biome: Fynbos and Grassland. East Africa and introduced world wide. Cultivated pasture, or weed, or ornamental (lawns). Description: Chippindall & Crook 1976 (182), Chippindall 1955 (444). Illustration: Chippindall 1955 (fig. 369). Voucher: Smook 1165. PRECIS code 9901390–00300.



Fig. 157.

Pennisetum foermerianum Leeke

Perennial; tufted and rhizomatous; 200–600 mm tall. Leaf blades 80–150 mm long; 2 mm wide. Spikelets 4.5–6.0 mm long; 1–2 mm wide. Rhizome stout, creeping; culms branched usually a few nodes up from base; inflorescence an interrupted panicle; spikelet clusters open; involucre



bristles plumose, usually about 5 mm long.

Flowering December to April. Sandy soil and mountainous areas. Locally common. Biome: Nama-Karoo. Endemic. Maybe confused with *Cenchrus ciliaris*, which has a dense, bristly false spike.

Description: Muller 1984 (208), Chippindall 1955 (447). Illustration: Muller 1984 (fig. 103), Chippindall 1955 (371). Voucher: Smook 5128. PRECIS code 9901390-00500.



Fig. 157. *Pennisetum clandestinum*

Pennisetum glaucocladum Stapf & C.E. Hubb.

Riverbank pennisetum.

Perennial; tufted; 1000–3000 mm tall. Leaf blades 300–650 mm long; 5–13 mm wide. Spikelets 3–6 mm long; 1 mm wide. Lowest leaf sheath with numerous transverse veins; leaf blades widely spaced and often held at right angles to culm; inflorescence 200–300 mm long; involucre bristles up to 30 and most of them longer than the spikelets; spikelets similar to *P. macrourum*.

Flowering January to May. River banks and wet areas. Infrequent. Biome: Savanna. Tropical Africa. Domestic use (thatching). This species grows much larger than *P. macrourum* and occurs more commonly along river banks.

Description: Chippindall 1955 (441). Illustration: Chippindall & Crook 1976 (184). Voucher: Tinley 437. PRECIS code 9901390-00600.



Pennisetum glaucum (L.) R. Br.

(=*P. americanum* (L.) Leeke subsp. *americanum*) 3; (=*P. albicauda* Stapf & C.E. Hubb.) 2; (=*P. echinurus* (K. Schum.) Stapf & C.E. Hubb.) 2; (=*P. nigritarum* (Schlecht.) Dur. & Schinz) 2; (=*P. typhoides* (Burm. f.) Stapf & C.E. Hubb.) 2; (=*Setaria lutescens* (Wieg.) F.T. Hubb.) 3.

Pearl millet.

Annual; tufted; 2000–3000 mm tall. Leaf blades 300–500 mm long; 20–50 mm wide. Spikelets about 7 mm



long; 5 mm wide. Inflorescence a false spike 200–500 mm long, 30 mm wide; each spikelet cluster on a hairy stalk about 5 mm long; involucre bristles shorter to as long as the spikelets, only the inner bristles plumose.

Flowering January to April. Widely cultivated in semi-arid tropics, may grow with as little as 250 mm rainfall per annum. Biome: Savanna and Grassland. Tropical and sub-tropical Africa. Cultivated pasture.

Description: Chippindall 1955 (447). Illustration: Chippindall 1955 (fig. 372). Voucher: Hardy, Retief and Herman 5315. PRECIS code 9901390-00650.

Pennisetum macrourum Trin.

Beddinggras.

Perennial; tufted; 800–2500 mm tall. Leaf blades 250–600 mm long; 4–11 mm wide. Spikelets 4–6 mm long; 1 mm wide. Rhizome creeping, often branched; inflorescence light green or straw-coloured, often tinged with purple, 120–250 mm long; involucre of up to 20 bristles which are mostly as long as the spikelets, with one bristle longer than the rest; lower glume minute or absent, upper glume 1/4–1/3 the length of the spikelet; lower floret reduced to a lemma; female-fertile (upper) lemma similar to lower lemma.

Flowering November to May. Near streams or damp places. Common. Biome: Fynbos, Savanna and Grassland. Tropical Africa. Clayton 1982 (690) regards *P. macrourum* as a polymorphic species including *P. natalense*, *P. glaucocladum* and 22 other tropical species.

Description: Chippindall 1955 (442), Clayton et al. 1970–1982 (689). Voucher: Smook 3167. PRECIS code 9901390-00700.



Pennisetum meianum Leekc

(=*P. stapfianum* F. Bol.).

Perennial; tufted and rhizomatous; to 600 mm tall. Leaf blades to 10 mm long; 3 mm wide. Spikelets 3–4 mm long; 1 mm wide. Rhizome short and woody; culms profusely branched and shrubby; inflorescence dense, 10–30 mm long; involucre bristles not plumose.

Flowering March to April. Prefers plains with impeded drainage. Infrequent. Biome: Savanna. Tropical and sub-tropical Africa. *P. stapfianum* is here considered to belong to this species, as the specimens available in Pretoria show no morphological differences.

Description: Clayton et al. 1970–1982 (686). Voucher: Smook 5117. PRECIS code 9901390-00800.



Pennisetum natalense Stapf

Suurbuffelsgras.

Perennial; tufted; 500–2000 mm tall. Leaf blades 100–400 mm long; 3–8 mm wide. Spikelets 2.5–3.5 mm long; 1 mm wide. Inflorescence 70–220 mm long; most involucre bristles twice as long as spikelets; lower floret male, lower palea almost as long as lemma.

Flowering February to June. Forms large tufts in water on river banks and vleis. Common. Biome: Savanna and Grassland. Similar to *P. macrourum*, which is a larger plant and lacks a lower palea.

Description: Chippindall 1955 (440). Illustration: Chippindall 1955 (fig 365). Voucher: Strey 10968. PRECIS code 9901390-00900.



***Pennisetum purpureum* Schumach.**

Napier fodder, elephant grass, mfufu.

Perennial; tufted; 1800–7500 mm tall. Leaf blades 30–400 mm long; 10–30 mm wide. Spikelets 4.5–7.0 mm long; 1 mm wide. Often forms tall, bamboo-like clumps; involucre of up to 40 bristles, the inner few are loosely plumose towards the base; lower floret usually male; in other spikelet characters similar to *P. macrourum*.

Flowering January to June. Riverine sites, valley floors and forest margins, with a preference for rich soils. Infrequent. Naturalized from tropical Africa. Biome: Savanna and Grassland. Tropical Africa. Domestic use (fencing reeds), or pasture (cultivated). Many cultivars and hybrids occur; a well known example is Banagrass, a cross with *P. glaucum*.

Description: Chippindall 1955 (443), Clayton et al. 1970–1982 (677). Illustration: Chippindall 1955 (fig. 368). Voucher: Smook 1794. PRECIS code 9901390–01100.

***Pennisetum setaceum* (Forssk.) Chiov.**

Fountain grass, pronkgras.

Perennial; tufted; 600–1000 mm tall. Leaf blades 20–40 mm long; 1–2 mm wide. Spikelets 4.0–6.5 mm long; 3 mm wide. Inflorescence purple, 100–250 mm long; involucre bristles, mostly about 20 mm long, 4–5 times as

Fig. 158. Pl. 145.



Fig. 158. *Pennisetum setaceum*

long as the spikelets, the inner bristles plumose.

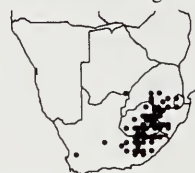
Flowering November to July. A ruderal on stony slopes and dry open places. Infrequent. Naturalized from north Africa. Biome: Fynbos, Savanna, and Nama-Karoo. To north Africa, Arabia. Garden ornamental.

Description: Chippindall 1955 (447). Illustration: Chippindall & Crook 1976 (183). Voucher: Retief & Reid 503. PRECIS code 9901390–01200.

***Pennisetum sphacelatum* (Nees) Dur. & Schinz**

Fig. 156.

(=*P. sphacelatum* (Nees) Dur. & Schinz var. *sphacelatum*) 3; (= *P. sphacelatum* (Nees) Dur. & Schinz var. *tenuifolium* (Hack.) Stapf) 3.



Bulgras.

Perennial; tufted; 400–900 mm tall. Leaf blades 100–400 mm long; 2–3 mm wide. Spikelets about 3 mm long; 1 mm wide. Leaves often filiform; inflorescence straw-coloured, 50–150 mm long, hairy for some distance below inflorescence; most involucre bristles equalling to twice as long as the spikelets.

Flowering November to April. Wet areas, vleis, usually hillsides, moist or clay soil. Common. Biome: Grassland. Similar to *P. macrourum*, which is a much larger plant.

Description: Chippindall 1955 (442). Illustration: Chippindall 1955 (fig. 366). Voucher: Smook 4692. PRECIS code 9901390–01300.

***Pennisetum thunbergii* Kunth**

Thunberg's pennisetum.

Perennial; tufted; 200–800 mm tall. Leaf blades 100–400 mm long; 4–7 mm wide. Spikelets 3 mm long; 1 mm wide. Inflorescence 30–50 mm long, purple; lower glume absent; upper glume 1/4–1/5 as long as spikelet; lemmas mucronate to nearly awned; anther lobes with a minute tuft of hairs at apex; other spikelet characters as for *P. macrourum*.

Flowering October to June. Grows in wet places, river banks, vleis. Common. Biome: Fynbos and Grassland. Uplands of African tropics and also occurs in Yemen and Sri Lanka.

Description: Chippindall 1955 (443), Clayton et al. 1970–1982 (687). Illustration: Chippindall & Crook 1976 (184), Chippindall 1955 (fig. 367). Voucher: Smook 2575. PRECIS code 9901390–01700.

***Pennisetum unisetum* (Nees) Benth.**

(=*Beckeropsis uniseta* (Nees) K. Schum.) 3.

Natal grass, silky grass

Perennial; tufted; 900–2400 mm tall. Leaf blades 200–450 mm long; 5–10 mm wide. Spikelets 2.5–3.5 mm long; 1 mm wide. Inflorescence a compound panicle, branches filiform, usually in groups of 2–5; spikelets subtended by a single bristle 3–4 times as long as spikelet.

Flowering March to June. Near water and in shady places. Common. Biome: Grassland. Cultivated pasture. Sometimes placed in a separate genus, *Beckeropsis*, because of the single involucre bristle and the reduction of the inflorescence to a single raceme; this species also apparently lacks the germination flap characteristic of *Pennisetum*.



Description: Chippindall 1955 (448). Illustration: Chippindall 1955 (fig. 373). Voucher: Nicholson 1750. PRECIS code 9901390-01750.

***Pennisetum villosum* R. Br. ex Fresen.**

Feathertop.

Perennial; tufted; 200–900 mm tall. Leaf blades 8–15 mm long; 3 mm wide. Spikelets 9–14 mm long; 4 mm wide. Inflorescence usually white, 40–100 mm long; involucre bristles nearly all plumose, some 4–5 times as long as spikelet, most of them about 30 mm long.



Flowering January to May. Roadsides and disturbed areas. Infrequent. Naturalized from Ethiopia. Biome: Savanna and Grassland. North and central Africa. Established ornamental.

Description: Chippindall 1955 (446). Voucher: Smook 2127. PRECIS code 9901390-01800.

***Pentameris* P. Beauv.**

Perennial; caespitose. Culms 250–2000 mm high; woody and persistent, or herbaceous (from a woody or suffrutescent base); branched above, or unbranched above. Leaf blades linear to linear-lanceolate. *Ligule a fringe of hairs.*

Inflorescence paniculate; open, or contracted (sometimes scanty); non-digitate (branching sometimes trichotomous); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 13–25 mm long (rarely to 30 mm); compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; much exceeding the spikelets; awned (setaceously acuminate), or awnless; similar (ovate-lanceolate, thin). All florets usually female-fertile only; distal incomplete florets occasionally present, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2 (rarely 1). Lemmas similar in texture to the glumes to decidedly firmer than the glumes; hairy (the hairs in longitudinal rows between the veins); without a germination flap; 7 or 9 (–11) nerved; incised; deeply cleft; awned. Awns 3; median and lateral (the lateral lemma lobes each with a 1–7 mm bristle from the inner side, more or less adnate below). The median awn different in form from the laterals; from the sinus; geniculate (near the middle); much longer than the body of the lemma. Palea present (hairy); relatively long; 2-nerved. Lodicules 2; fleshy; ciliate, or glabrous. Stamens 3. Ovary hairy (with a deciduous apical tomentum, of branched hairs). Fruit small (3 mm); subglobose; hilum long-linear; pericarp free; embryo small.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Arundinoideae; Danthoniaeae. 7 species. South Africa. Mesophytic; in open habitats; glycophytic. Cape Province. 7 indigenous species.

References. 1. Schweickerdt. 1938. Feddes Reprium 42: 91. 2. Chippindall. 1955. Gr. & Past. 3. Ellis. 1985a. Bothalia 15: 561–566. 4. Ellis. 1985b. Bothalia 15: 567–571. 5. Ellis. 1985c. Bothalia 15: 573–578. 6. Ellis. 1985d. Bothalia 15: 579–585. 7. Ellis. 1986. Bothalia 16: 235–241. 8. Barker. 1986. Bothalia 16: 65–69.

Species treatment by N.P. Barker.

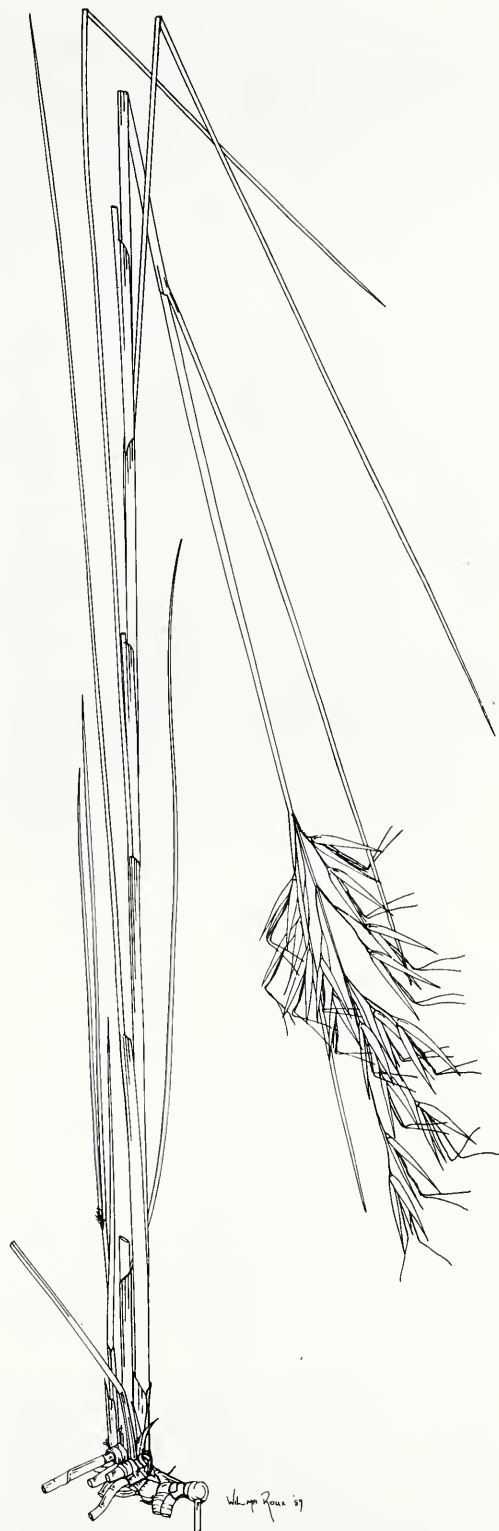


Fig. 159. *Pentameris macrocalycina*

- 1(0). Spikelets with one floret **P. sp. 2** (=Ellis 2546)
Spikelets with two florets 2
- 2(1). Leaf sheaths with purple to dark brown or black auricles; lemma lobes truncate, free from lateral bristle **P. thuarii**
Leaves without dark auricles; lemma lobes acute or acuminate, adnate to lateral bristle for half or all their length 3
- 3(2). Panicle lax, globose, 170–300 mm long; basal leaf sheaths 120 mm long or longer, clustered around and free from the culm base; culm plus inflorescence usually taller than 1200 mm **P. longiglumis**
Panicle contracted, lanceolate, up to 150 mm long; basal leaf sheaths seldom longer than 120 mm, partially free or appressed to the culm base; culm plus inflorescence up to 1200 mm in height . . . 4
- 4(3). Glumes usually with three nerves at the very base; lodicules ciliate, cilia as long or longer than lodicule body **P. obtusifolia**
Glumes 1-nerved; lodicules glabrous or shortly ciliate, sometimes with one or two arm-like extensions. 5
- 5(4). Leaves flexible, pubescent or sometimes glabrous, rolled, folded or open; glumes 12–16 mm long **P. dregeana**
Leaves rigid, glabrous, cylindrical, permanently infolded or tightly rolled with narrow, deep adaxial groove; glumes 15 mm or longer 6
- 6(5). Leaf blades straight to falcate, 30–350 mm long, acicular, permanently infolded, sometimes pungent; leaf sheaths tightly appressed to culm; found at all altitudes **P. macrocalycina**
Leaf blades falcate to curled (especially when dead), up to 110 mm long, tightly rolled, strongly pungent; leaf sheaths not tightly appressed to culm; found at high altitudes only. **P. sp. 1** (=Esterhuysen 11115)

Pentameris dregeana Stapf

Perennial; decumbent to tufted; 300–1000 mm tall. Leaf blades to 250 mm long; to 1.5 mm wide. Spikelets 12–17 mm long (excluding awns); to 10 mm wide. Culms often branched basally; leaf sheaths pubescent to woolly, without auricle, sheath mouth densely bearded; blades open, folded or rolled, flexible, rarely glabrous, usually densely pubescent, especially near the base; panicle lanceolate, loosely contracted, 50–110 mm long; spikelets 2-flowered; glumes 12–16 mm long, 1-nerved, glabrous or pubescent; lemma lobes acuminate, partially fused to lateral bristle; lodicules glabrous or ciliate, sometimes with one or two arm-like extensions.



Flowering September to December. In rock crevices and coarse sandy soil of the Cape fold mountains. Infrequent to common (after fire). Biome: Fynbos. Endemic. Domestic use (used for bedding in mountain huts and caves). A widespread Fynbos species which is quite variable. Ellis (1986) found three anatomical forms within this species.

Description: Stapf 1898–1900 (515), Chippindall 1955 (253). Illustration: Chippindall 1955 (fig. 224 (spikelet only)). Voucher: Compton 13952. PRECIS code 9902080–00100.

Pentameris longiglumis (Nees) Stapf

Perennial; tufted; to 1700 mm tall. Leaf blades to 550 mm long; to 4 mm wide. Spikelets 16–25 mm long; to 10 mm wide. Culms erect, unbranched; basal sheaths persistent, 120 mm or longer, 10 mm or more wide, loose or free from culm; leaf sheaths without auricles; leaf blades glabrous, rigid, rolled; panicle lax, globose, 170–300 mm long; spikelets 2-flowered; glumes 15–25 mm long, 1-nerved, glabrous; lemma lobes acuminate, adnate to lateral bristle for most of their length; lodicules glabrous.



Flowering September to December. Moist, rocky slopes. Rare. Biome: Fynbos. Endemic. There are two morphologically and geographically distinct varieties, separable on the size of the floral parts. Ellis (1985b) considers this species to be anatomically distinct, but allied to *P. macrocalycina*.

Description: Stapf 1898–1900 (514), Chippindall 1955 (253). Voucher: Taylor 7231. PRECIS code 9902080–00200.

Pentameris macrocalycina (Steud.) Schweick.

(= *P. speciosa* Nees) 1.

Fig. 159.

Perennial; tufted; 400–1100 mm tall. Leaf blades 30–350 mm long; to 1.5 mm wide. Spikelets 17–25 mm long; 5–10 mm wide. Culms branching basally; leaf sheaths tightly appressed to culm, bearded at the mouth, auricles absent; leaf blades rigid, erect, glabrous, acicular, sometimes pungent, permanently folded into a cylinder with deep adaxial groove when seen in cross section; panicle contracted, lanceolate, 60–120 mm long; spikelets 2-flowered; glumes 16–24 mm long, 1-nerved, glabrous; lemma lobes acuminate, adnate to lateral bristle for most of their length; lodicules glabrous.



Flowering September to December. In rock crevices and stony or sandy soils. Infrequent to common (after fire). Biome: Fynbos. Endemic. Plants are vegetatively variable, as those growing soon after fire are rigid and robust, whereas plants from older Fynbos are softer. Ellis (1985d) has found this species to be anatomically quite constant.

Description: Stapf 1898–1900 (515), Chippindall 1955 (252). Illustration: Chippindall 1955 (fig. 223). Voucher: Esterhuysen 23236. PRECIS code 9902080–00300.

Pentameris obtusifolia (Hochst.) Schweick.

(= *P. squarrosa* Stapf) 1.

Perennial; decumbent scrambler; seldom more than 500 mm tall. Leaf blades 50–150 mm long; to 4 mm wide. Spikelets 20–26 mm long; 5–10 mm wide. Culms much branched, produced from a woody base, decumbent, to 900 mm long, protected by the remains of numerous overlapping, leaf sheaths from base to growth point; leaf sheaths appressed to culms, without auricles; leaf blades short, rigid, rolled, present only at branch tips; panicle contracted, lanceolate, 70–130 mm long; spikelets 2-flowered; glumes pale, 18–25 mm long, generally 3-nerved at the base; lemma lobes almost fully adnate to lateral bristle; lodicules densely long-ciliate at apex.



Flowering January to April. Lower slopes of Hottentots Holland and Kogelberg mountains. Locally common. Biome: Fynbos. Endemic. Anatomical studies (Ellis 1985b), seed morphology (Barker 1986) and floral morphology indicate that this species does not belong in this genus. However, correct generic placing currently impossible because acceptable generic limits have not been established in the subfamily.

Description: Stapf 1898–1900 (536). Voucher: Barker 331. PRECIS code 9902080–00400.

Pentameris thuarii Beauv.

Pl. 146.

Perennial; tufted; 350–2000 mm tall. Leaf blades to 500 mm long; to 10 mm wide. Spikelets 16–22 mm long; 5–8 mm wide. Culms single or branched; leaf sheaths with purple to dark brown or black auricles; leaf blades open or folded, glabrous to sparsely pubescent; panicle lax, globose, 70–220 mm long; spikelet 2-flowered; glumes 16.0–21.5 mm long, 1-nerved, glabrous; lemma lobes truncate, almost wholly free from lateral bristle; lodicules glabrous.

Flowering September to December. In seeps and along river banks. Locally common (in damp habitats). Biome: Fynbos. Endemic. This species has been divided by Nees into two varieties based on overall plant size, but this character is too variable to be useful. It is anatomically distinct from the other species in the genus (Ellis 1985c).

Description: Stapf 1898–1900 (513), Chippindall 1955 (252). Illustration: Chippindall 1955 (fig. 222 (spikelet only)). Voucher: McDonald 816. PRECIS code 9902080–00500.

Pentameris sp. 1 (=Esterhuysen 11115)

Perennial; tufted; 250–470 mm tall. Leaf blades 60–110 mm long; to 1.5 mm wide. Spikelets 15–21 mm long; to 10 mm wide. Culms sometimes branched and somewhat decumbent; leaf sheaths loosely appressed to culm, without auricles; leaf blades tightly rolled, falcate to curled, especially when dead, strongly pungent; panicle contracted, 30–83 mm long; spikelets 2-flowered; glumes 1-nerved, generally glabrous, 15.5–20.0 mm long; lemma lobes acute to acuminate, adnate to lateral bristle for about half their length; lodicules glabrous.

Flowering September to December. High altitude mountains. Locally common (Hottentots Holland, Hexrivier and Riviersonderend mountains). Biome: Fynbos. Endemic. This species, included in *P. obtusifolia* by PRE in the past, is anatomically similar to *P. macrocalycina* (Ellis 1985d). It is distinguished from this latter species by the rolled but not permanently folded, falcate leaf blades, and leaf sheaths which are loose to free from the culm. This new species consists of two morphological forms, distinguished by glume vestiture.

Voucher: Esterhuysen 11115. PRECIS 9902080–99999.

Pentameris sp. 2 (=Ellis 2546)

Perennial; decumbent to tufted; about 400 mm tall. Leaf blades to 130 mm long; to 1 mm wide. Spikelets 11–13 mm long; 5–8 mm wide. Culms slender, to 650 mm long; leaf sheaths without auricles; leaf blades filiform; panicle 40–60 mm long; spikelets 1-flowered; glumes 11–12 mm long, 1-nerved, glabrous; lemma lobes

acuminate, almost fully adnate to lateral bristle; lodicules glabrous or minutely ciliate.

Flowering September to December. Damp south facing cliffs of Cape fold mountains. Infrequent. Biome: Fynbos. Endemic. Although only having one floret, this species belongs in the genus on the basis of seed characters, the carpopsis being an achene with the characteristic apical appendages.

Voucher: Ellis 2546. PRECIS code 9902080–99999.

Pentaschistis (Nees) Spach

Achneria Benth., *Afrachneria* Sprague, *Poagrostis* Stapf.

Perennial (usually), or annual (less commonly); usually caespitose. Culms 100–1500 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear to lanceolate (or filiform, often with stalked or saucer-shaped glands); rolled (usually), or flat. *Ligule a fringe of hairs.*

Inflorescence paniculate (the branches often with glands); open, or contracted (sometimes spicate); espatheate. Spikelet-bearing axes persistent.



Fig. 160. *Pentaschistis airoides* subsp. *airoides*

Spikelets 1–19 mm long; compressed laterally; disarticulating above the glumes. *Callus* short. *Hairy callus present*. Glumes two; more or less equal; *about equalling the spikelets to much exceeding the spikelets*; awnless; similar (narrow to lanceolate, green or scarious, rarely hyaline, shining, often with glands). All florets usually female-fertile only; distal incomplete florets occasionally present, merely underdeveloped; *proximal incomplete florets absent*.

Female-fertile florets 2 (rarely 1 - Poagrostis). Lemmas similar in texture to the glumes (membranous); *incised (bifid, rarely 3–4-fid)*; hairy, or hairless; without a germination flap; 5–7 nerved; *not deeply cleft*; awnless, or mucronate, or awned (generally awned from the central sinus, and with a point or straight awn on each lobe). *Awns* when present *1 (rarely), or 3 (usually), or 5 (rarely)*; median, or median and lateral (usually). The median awn different in form from the laterals (when laterals present, they are inserted in the sinus and partially fused to the lateral lemma lobes); from the sinus; usually geniculate; much longer than the body of the lemma. Palea present; relatively long; 2-nerved. Lodicules 2; fleshy; glabrous (or with bristles). Stamens 3. Ovary glabrous. Fruit small; hilum short (but linear-oblong); pericarp free, or fused, or loosely adherent; embryo large to small.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 7, 10$, and 13. Arundinoideae; Danthonieae. About 65 species. Africa, Madagascar. Xerophytic, or mesophytic; in open habitats; glycophytic. Namibia, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 57 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1969. Kew Bull. 23: 294. 3. Linder & Ellis. 1989. Contr. Bol. Herb. 12.

Species treatment by H.P. Linder & R.P. Ellis.

Key to species groups

- Plants annual Key A
- Spikelets without awns Key B
- Plants with stalked glands Key C
- Plants with villous bases Key D
- Plants without stalked glands Key E

Key A. Plants annual

- 1(0). Spikelets 15–18 mm long *P. trisetata*
- Spikelets 2.5–5.0 mm long 2
- 2(1). Lemmas without awns *P. capillaris*
- Lemmas with awns 3
- 3(2). Leaves with slender long aristae *P. aristifolia*
- Leaves without aristae 4
- 4(3). Anthers 0.3 mm long, plants very fine, with slender leaves *P. airoides* subsp. *airoides*
- Anthers 0.5–3.0 mm long, plants more robust *P. patula*

Key B. Spikelets without awns

- 1(0). Leaves borne on erect aerial stems; inflorescence either a spike or with spikelets reflexed 2
- Leaves borne basally; inflorescence always an open panicle, spikelets not reflexed 3
- 2(1). Inflorescence a dense spike; plants without glands *P. ecklonii*
- Inflorescence a panicle with reflexed spikelets; glume keels glandular *P. reflexa*
- 3(1). Inflorescence nodes glabrous 4
- Inflorescence nodes villous 8
- 4(3). Spikelets usually 1-flowered, 2.5–3.0 mm long *P. pusilla*
- Spikelets always 2-flowered, 3–7 mm long 5
- 5(4). Spikelets 3 mm long; plants mat-forming; leaves stiff, 2–4 mm broad, less than 10 mm long *P. microphylla*

- Spikelets 3.5–7.0 mm long; plants caespitose; leaves soft, 1–6 mm broad and more than 10 mm long . 6
- 6(5). Plants with flat woody bases, with scattered culms rising through the vegetation; often with conspicuous glands *P. ampla*
- Plants with compact, caespitose bases; with inconspicuous linear pedicel glands 7
- 7(6). Spikelets 3.5–5.0 mm long; plants often glabrous . . . *P. aurea* subsp. *aurea*
- Spikelets 6–7 mm long; plants usually softly villous *P. aurea* subsp. *pilosogluma*
- 8(3). Glumes obtuse, the apex finely brown-puberulous; plants without glands *P. malouinensis*
- Glumes acute, glabrous; plants with stalked glands 9
- 9(8). Plants annual; spikelets 3 mm long . . . *P. capillaris*
- Plants perennial; spikelets 3.5–6.0 mm long 10
- 10(9). Plants caespitose, usually villous; leaves to 1 mm wide *P. setifolia*
- Plants mat-forming, glabrous; leaves 2–4 mm wide *P. galpinii*

Key C. Plants with stalked glands

- 1(0). Lemmas without awns 2
- Lemmas with awns 8
- 2(1). Inflorescence a dense spike *P. ecklonii*
- Inflorescence an open panicle 3
- 3(2). Spikelets reflexed *P. reflexa*
- Spikelets not reflexed 4
- 4(3). Plants annual *P. capillaris*
- Plants perennial 5
- 5(4). Plants caespitose; leaves linear, more than 20 mm long 6
- Plants short, mat-forming with creeping rhizomes; leaves less than 20 mm long 7
- 6(5). Glumes finely acute to acuminate; plant base a flat woody disc *P. ampla*
- Glumes obtuse to acute; plant base contracted, not forming a flat woody disc *P. setifolia*
- 7(5). Inflorescence nodes glabrous; inflorescence staying open after flowering *P. microphylla*
- Inflorescence nodes villous; inflorescence contracting after flowering *P. galpinii*
- 8(1). Lateral awns included within the glumes 9
- Lateral awns as long as or exerted from the glumes 13
- 9(8). Central awn 0–5 mm long 10
- Central awn 6–12 mm long 11
- 10(9). Plants glabrous; from the Drakensberg *P. galpinii*
- Plants puberulous to villous; from Namaqualand *P. tomentella*
- 11(9). Plants annual; nodes with rings of bristles *P. patula*
- Plants perennial 12
- 12(11). Leaves rigid, setaceous, stiffly erect *P. lima*
- Leaves flaccid, generally expanded . *P. oreodoxa*
- 13(8). Plants annual or weakly perennial; anthers 0.3–1.0 mm long 14
- Plants perennial; anthers 1.5–5.0 mm long ... 15
- 14(13). Plants weakly perennial; inflorescence nodes villous *P. airoides* subsp. *jugorum*
- Plants annual; inflorescence nodes glabrous or puberulous *P. airoides* subsp. *airoides*
- 15(13). Leaves cauline 16
- Leaves basal 19
- 16(15). Spikelets 3.5–4.5 mm long; old leaves turning pink; plants to 30 mm tall *P. densifolia*
- Spikelets 5–7 mm long; old leaves drying grey or pink; plants more than 30 mm tall 17
- 17(16). Lateral awns 5–6 mm long; central awn 11–14 mm long *P. papillosa*
- Lateral awns 3 mm long; central awn 8–11 mm long 18

- 18(17). Plants cushion-forming; lateral awns as long as the glumes; anthers 2.3–2.8 mm long . . . **P. aspera**
Plants loosely caespitose; lateral awns exerted from the glumes; anthers 1.8–2.0 mm long . . . **P. barbata**
- 19(15). Spikelets evenly scattered in an expanded inflorescence, with the pedicels longer than the spikelets 20
Spikelets clustered in an expanded inflorescence, with the pedicels as long as or shorter than the spikelets 22
- 20(19). Spikelets 6–7 mm long; awn 9–13 mm long . . . 21
Spikelets 4.5–5.0 mm long; awn 7 mm long **P. longipes**
- 21(20). Plants from Natal to Kenya; glands minute, only on the keels of glumes **P. natalensis**
Plants from the southwestern Cape; glands variable **P. rupestris**
- 22(19). Glands sunken, scattered on the backs of the U-shaped leaves **P. glandulosa**
Glands stalked, usually restricted to veins and leaf margins 23
- 23(22). Lemma length 1.5–2.9 mm 24
Lemma length 3–4 mm 27
- 24(23). Spikelets 3–5 mm long; awns 6–7 mm long **P. pallida**
Spikelets 5–7 mm long; awns 7–12 mm long . . . 25
- 25(24). Leaves rigid, less than 3 mm wide, usually not glandular along the margins **P. pallida**
Leaves flaccid, more than 3 mm wide, usually densely glandular along the margins 26
- 26(25). Lateral awns exerted from the glumes; basal sheaths white; lemmas 2.8–3.0 mm long **P. barbata**
Lateral awns as long as the glumes; basal sheaths soon decaying; lemmas 2.0–2.8 mm long **P. veneta**
- 27(23). Inflorescence contracted; glumes hyaline or white; a coastal dune or limestone plant . . . **P. pallida**
Inflorescence open; glumes usually greenish, brownish or purplish; not on dunes 28
- 28(27). Glumes acute; restricted to the Drakensberg **P. oreodoxa**
Glumes acuminate; from southern and western Cape Province 29
- 29(28). Leaves usually rolled, less than 2 mm wide **P. cirrhulosa**
Leaves always expanded, 2–6 mm wide 30
- 30(29). Spikelets 7–8 mm long; plants glabrous or with fine hairs **P. rupestris**
Spikelets 5.0–6.5 mm long; plants coarsely hairy with cushion-based hairs **P. veneta**

Key D. Plants with villous bases

- 1(0). Awns 15–25 mm long 2
Awns 5–12 mm long 6
- 2(1). Old leaf blades expanded and recurved; blades sometimes rigid and pungent **P. pungens**
Old leaf blades rolled and shriveled; blades never pungent 3
- 3(2). Glumes 12–20 mm long, straw-coloured to brown; awns 20–25 mm long 4
Glumes 8–12 mm long, silvery; awns 10–20 mm long 5
- 4(3). Plants with horizontal rhizomes; lemmas 5.5–7.0 mm long **P. aristidoides**
Plants without rhizomes; lemmas 3–4 mm long **P. velutina**
- 5(3). Leaf blades glabrous; base of plant stoloniferous **P. argentea**
Leaf blades hairy; base of plant compact **P. viscidula**
- 6(1). Leaves rolled, 0.5–1.5 mm wide 7
Leaves expanded, 1–6 mm wide 8
- 7(6). Plants without glands; spikelets 10–12 mm long **P. pyrophila**

- Plants with glandular inflorescences; spikelets 6–7 mm long **P. lima**
- 8(6). Plants forming stout tussocks; leaves to 6 mm wide; spikelets 7–8 mm long **P. rupestris**
Plants loosely caespitose; leaves 1–4 mm wide; spikelets 5.0–6.5 mm long **P. pallida**

Key E. Plants without stalked glands

- 1(0). Plants annual **P. aristifolia**
Plants perennial 2
- 2(1). Lemmas without awns 3
Lemmas with awns 7
- 3(2). Inflorescence often spike-like; glumes apically blunt, brown-puberulous **P. malouinensis**
Inflorescence a panicle; glumes acute, glabrous or scaberulous 4
- 4(3). Spikelets usually 1-flowered, 2.5–3.0 mm long **P. pusilla**
Spikelets 2-flowered, 4–7 mm long 5
- 5(4). Plants with flat woody bases **P. ampla**
Plants with compact caespitose bases 6
- 6(5). Spikelets 3.5–5.0 mm long; plants often glabrous **P. aurea subsp. aurea**
Spikelets 6–7 mm long; plants usually softly villous **P. aurea subsp. pilosogluma**
- 7(2). Inflorescence linear or densely contracted 8
Inflorescence an open, hemispherical panicle . . . 19
- 8(7). Spikelets 3–6 mm long, if more than 6 mm long then the leaves are finely villous (*P. calcicola* var. *hirsuta*) 9
Spikelets 7–15 mm long; leaves usually glabrous 11
- 9(8). Lemmas with 5–9 awns **P. heptamera**
Lemmas with 3 awns 10
- 10(9). Awn 10–12 mm long; from South Africa **P. calcicola subsp. hirsuta**
Awn 6 mm long; from South or northeast Africa **P. pallida**
- 11(8). Sheaths, or at least the sheath mouth, hairy **P. eriostoma**
Sheaths villous or glabrous 12
- 12(11). Leaf margins thickened; spikelets ivory-coloured **P. curvifolia**
Leaf margins not thickened; spikelets various . . . 13
- 13(12). Leaves densely villous on inside down whole length – if broken the strands clearly visible **P. basatorum**
Leaves not densely hairy on the whole length of the inside 14
- 14(13). Base of plant swollen and densely hairy; awns 15–20 mm long **P. argentea**
Base of plant not swollen, more or less glabrous; awns 8–15 mm long 15
- 15(14). Inflorescence with 10–100 spikelets 16
Inflorescence with 100–300 spikelets 18
- 16(15). Inflorescence linear, 10–20 mm wide; lemma lobes half as long as the lemma, ca. 2 mm long; from the Drakensberg **P. praecox**
Inflorescence linear to contracted, 15–30 mm wide; lemma lobes less than half as long as the lemma, ca. 1 mm long; from the southern and western Cape Province 17
- 17(16). Spikelets 10–12 mm long **P. pyrophila**
Spikelets 7–8 mm long **P. rigidissima**
- 18(15). Lateral awns 4–5 mm long, as long as the glumes; sheath mouth glabrous **P. tortuosa**
Lateral awns 5.5–6.0 mm long, longer than the glumes; sheath mouth villous . . . **P. eriostoma**
- 19(7). Leaves rolled, setaceous 20
Leaves expanded 32
- 20(19). Lateral awns 0.1–3.0 mm long 21
Lateral awns 3.5–15.0 mm long 26
- 21(20). Lateral awns 0.1–1.0 mm long; central awn 3–4 mm long **P. holciformis**
Lateral awns 1–3 mm long; central awn 5–12 mm long 22

- 22(21). Leaves rigid, pungent; plants forming spiny tufts
 **P. rigidissima**
 Leaves flaccid, not pungent; plants soft 23
- 23(22). Lemmas more than 3 mm long; leaves stiffly erect,
 glabrous, usually with a sheath of burnt-off basal
 fibres **P. tysonii**
 Lemmas to 3 mm long; leaves curly, usually
 villous, rarely with a sheath of burnt-off basal
 fibres 24
- 24(23). Inflorescence with 50–100 spikelets; from the
 eastern Transvaal **P. chippindalliae**
 Inflorescence with 5–50 spikelets; from the western
 Cape Province 25
- 25(24). Central awn 5–6 mm long; plants with a strong base
 **P. montana**
 Central awn 7–10 mm long; plants with weak bases
 **P. alticola**
- 26(20). Glumes often with cushion-based hairs; bases of
 plants weak, with decaying brown leaf remnants
 **P. rosea subsp. rosea**
 Glumes without cushion-based hairs; bases of
 plants woody, usually with white sheaths .. 27
- 27(26). Inflorescence with fewer than 30 spikelets
 **P. colorata**
 Inflorescence with more than 50 spikelets 28
- 28(27). Awns 15–25 mm long 29
 Awns 5–11 mm long 30
- 29(28). Awns 15–20 mm long; spikelets 7–10 mm long ..
 **P. viscidula**
 Awns 20–25 mm long; spikelets 12–15 mm long
 **P. velutina**
- 30(28). Lateral awns included in glumes **P. tysonii**
 Lateral awns exerted from glumes 31
- 31(30). Plants to 300 mm tall; sheath bases brown;
 inflorescence nodes glabrous
 **P. calcicola var. calcicola**
 Plants to 600 mm tall, sheath bases white;
 inflorescence nodes villous **P. exserta**
- 32(19). Leaves cauline, all leaves along the stem the same
 size 33
 Leaves basal or radical 35
- 33(32). Inflorescence nodes glabrous; plants rhizomatous;
 from coastal sands **P. scandens**
 Inflorescence nodes villous; plants without
 rhizomes; from mountains 34
- 34(33). Sheath mouth and lemmas glabrous; anthers 1.2
 mm long **P. caulescens**
 Sheath mouth and lemmas villous; anthers 4.0–4.5
 mm long **P. acinosa**
- 35(32). Awns spreading, not geniculate **P. capensis**
 Awns erect, geniculate 36
- 36(35). Glumes usually with cushion-based hairs; bases
 weak; culms often geniculate; glumes purplish
 **P. rosea subsp. purpurascens**
 Glumes never with cushion-based hairs; plants not
 with the above combination of characters .. 37
- 37(36). Glumes 5–9 mm long **P. elegans**
 Glumes 10–20 mm long 38
- 38(37). Old leaves expanded, curling; young leaves often
 pungent **P. pungens**
 Old leaves rolled; young leaves never pungent . 39
- 39(38). Awns 20–25 mm long; plants with strong creeping
 rhizomes **P. aristoides**
 Awns 10–17 mm long; plants caespitose 40
- 40(39). Lateral awns 4–8 mm long; anthers 2.7–3.0 mm
 long; basal leaves brown and rolled
 **P. pseudopallescens**
 Lateral awns 3 mm long; anthers 3.5–4.0 mm long;
 basal leaves flat **P. pallescens**

Pentaschistis acinosa Stapf

Perennial; loosely tufted (or even cushion-forming); 150–300 mm tall. Leaf blades to 40 mm long; to 4 mm wide. Spikelets 9–10 mm long. Plants without glands; leaves spreading on erect stems; lemmas awned.



Flowering (anthesis) October to January. Restricted to sandstone rock ledges. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (495), Chippindall 1955 (261), Linder & Ellis 1990 (99). Illustration: Chippindall 1955 (fig. 230). Voucher: Esterhuysen 35125 (BOL). PRECIS code 9902050–00100.

Pentaschistis airoides (Nees) Stapf subsp. **airoides**

Fig. 160.

(= *P. patula* (Nees) Stapf var. *glabrata* Stapf) 3.



Annual; 60–350 mm tall. Leaf blades to 30 mm long; to 2 mm wide. Spikelets 2.5–3.5 mm long. Plants with stalked glands; lemmas awned, 1.5–1.8 mm long; anthers less than 0.5 mm long.

Flowering (anthesis) August to December. On 'richer' soils, and absent from sandstone derived soils. Common. Biome: Fynbos, Nama-Karoo, and Succulent Karoo. Endemic.

Description: Stapf 1898–1900 (510, 511), Chippindall 1955 (242, 269), Linder & Ellis 1990 (48). Voucher: Linder 4289 (BOL). PRECIS code 9902050–00200.

Pentaschistis airoides (Nees) Stapf subsp. **jugorum**

(Stapf) Linder

(= *P. jugorum* Stapf) 3.



Biennial; tufted (nearly cushion-forming); 60–350 mm tall. Leaf blades 40–60 mm long; 1–3 mm wide. Spikelets 3.5–5.0 mm long. Plants with stalked glands; lemmas awned; anthers 0.5–1.0 mm long.

Flowering (anthesis) February. On shallow soils and disturbed areas in alpine and high montane areas. Common. Biome: Afromontane. Endemic.

Description: Stapf 1898–1900 (504), Chippindall 1955 (264), Linder & Ellis 1990 (48). Voucher: Linder 4840 (BOL). PRECIS code 9902050–00250.

Pentaschistis alticola Linder

Biennial; cushion-forming, with weak bases; 100–300 mm tall. Leaf blades 30–80 mm long; 0.2–0.5 mm wide. Spikelets 4–6 mm long. Plants without glands; lemmas with an awn 7–10 mm long.



Flowering (anthesis) November to January. Flowering after fire, on rocky upper slopes of sandstone mountains. Locally common (on mountain slopes). Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (79). Illustration: Linder & Ellis 1990 (fig. 10). Voucher: Esterhuysen 28359 (BOL). PRECIS code 9902050–00260.

***Pentaschistis ampla* (Nees) McClean**

Perennial; tufted (tussocks weak, from a woody base); 400–700 mm tall. Leaf blades to 300 mm long; 1–6 mm wide. Spikelets 3.3–4.6 mm long. Pedicels usually with obscure linear glands, rarely with obscure sunk-en glands; lemmas muticous.

Flowering (anthesis) December to March. At low to mid-altitudes on sandstone derived soils, often found on rock ledges. Common. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Chippindall 1955 (266), Linder & Ellis 1990 (59). Illustration: Chippindall 1955 (fig. 236), Linder (fig. 2). Voucher: Esterhuysen 22769 (BOL). PRECIS code 9902050–00300.

***Pentaschistis argentea* Stapf**

(= *P. involuta* sensu Adamson and Chippindall) 3.

Perennial; tufted (geophytic with a swollen villous underground base, often with stolons); 300–800 mm tall. Leaf blades to 250 mm long; to 2 mm wide. Spikelets 9–12 mm long. Plants without glands or with glands linear, restricted to the pedicels; lemmas awned.

Flowering (anthesis) October and November. On dry mountain slopes and foothills in sandstone derived soils. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (487), Chippindall 1955 (258), Linder & Ellis 1990 (68). Voucher: Linder 4351 (BOL). PRECIS code 9902050–00650.

***Pentaschistis aristidoides* (Thunb.) Stapf**

Perennial; rhizomatous (rhizomes stout, villous; shoots single or several in groups of 3–5); 500–1000 mm tall. Leaf blades to 300 mm long; 5–10 mm wide. Spikelets 12–20 mm long. Leaves mostly borne directly on the rhizomes; pedicels with obscure linear glands; lemmas awned.

Flowering (anthesis) September to November. On rocky sandstone slopes, occasionally on sandy flats. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (485), Chippindall 1955 (257), Linder & Ellis 1990 (65). Illustration: Chippindall 1955 (fig. 225.6). Voucher: Esterhuysen 32766 (BOL). PRECIS code 9902050–00900.

***Pentaschistis aristifolia* Schweick.**

Annual; about 250 mm tall. Leaf blades to 60 mm long; to 4 mm wide. Spikelets 2.5–3.0 mm long. Plants without glands; leaf apices with long slender aristae; lemmas awned.

Flowering (anthesis) September and October. On heavier soils associated with the Karoo sediments. Common. Biome: Nama-Karoo. Endemic.

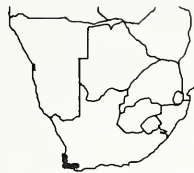
Description: Chippindall 1955 (270), Linder & Ellis 1990 (49). Voucher: Linder 4279 (BOL). PRECIS code 9902050–01000.

***Pentaschistis aspera* (Thunb.) Stapf**

Perennial; cushion-forming; 300–600 mm tall. Leaf blades 40–100 mm long; 3–6 mm wide. Spikelets 5–7 mm long. Culms branched; leaf margins with prominent stalked glands; lateral lemma awns as long as the glumes; central lemma awn 8–10 mm long.

Flowering (anthesis) September to December. In light disturbances on stony slopes, on both granitic and quartzitic soils. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (500), Chippindall 1955 (262), Linder & Ellis 1990 (32). Illustration: Chippindall 1955 (fig. 231). Voucher: Bolus 3340 (BOL). PRECIS code 9902050–01100.

***Pentaschistis aurea* (Steud.) McClean subsp. *aurea***

Perennial; tufted (bases compact); 300–450 mm tall. Leaf blades to 300 mm long; 1–5 mm wide. Spikelets 3.5–5.0 mm long. Pedicels with obscure linear glands; lemmas muticous.

Flowering (anthesis) January to March. Usually in marshy areas on sandstone derived soils, usually at lower altitudes. Common. Biome: Fynbos. Endemic.

Description: Chippindall 1955 (267), Linder & Ellis 1990 (76). Illustration: Chippindall 1955 (238). Voucher: Esterhuysen 33107 (BOL). PRECIS code 9902050–01200.

***Pentaschistis aurea* (Steud.) McClean subsp. *pilosogluma* (McClean) Linder**

(= *P. pilosogluma* McClean) 3.

Perennial; tufted (forming large floppy tussocks); 600–700 mm tall. Leaf blades to 350 mm long; to 5 mm wide. Spikelets 6–7 mm long. Plants sometimes with obscure linear glands; lemmas muticous.

Flowering (anthesis) December to February. Along streams and seepages on cave sandstone and basaltic soils. Infrequent. Biome: Afromontane. Endemic.

Description: Chippindall 1955 (266), Linder & Ellis 1990 (76). Illustration: Chippindall 1955 (fig. 235). Voucher: Linder 4858 (BOL). PRECIS code 9902050–01250.

***Pentaschistis barbata* (Nees) Linder subsp. *barbata***

(= *P. angulata* sensu Adamson, non Nees) 3; (= *P. leucopogon* Stapf) 3.

Perennial; weakly tufted (almost forming cushions); 300–600 mm tall. Leaf blades to 200 mm long; to 12 mm wide. Spikelets 5–6 mm long. Leaf margins and pedicels usually with stalked glands; lemmas awned, the lateral awns exerted from the glumes.

Flowering (anthesis) September to November. Coastal sands in slightly disturbed areas. Common (west coast sand flats). Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (500), Chippindall 1955 (262), Linder & Ellis 1990 (31). Voucher: Esterhuysen 31336 (BOL). PRECIS code 9902050–01320.



Pentaschistis barbata* (Nees) Linder subsp. *orientalis
Linder

Perennial; tufted; 300–600 mm tall. Leaf blades to 300 mm long; to 9 mm wide. Spikelets 8–10 mm long. Leaf margins with stalked glands; lemmas awned, 5 mm long.

Flowering (anthesis) February. On coastal dunes. Conservation status not known. Infrequent. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (31). Voucher: Van der Merwe 2168 (STE). PRECIS code 9902050–01370.



***Pentaschistis basutorum* Stapf**

Perennial; tufted; 500–700 mm tall. Leaf blades to 600 mm long; to 0.5 mm wide. Spikelets 7–10 mm long. Plants without glands; leaves tough, villous inside; lemmas awned.

Flowering (anthesis) December and January. On shallow soil over sandstone. Locally common (western slopes of Drakensberg). Biome: Afromontane. Endemic.

Description: Chippindall 1955 (260), Linder & Ellis 1990 (94). Voucher: Dieterlen 1162 (BOL). PRECIS code 9902050–01400.



Pentaschistis calcicola* Linder var. *calcicola

Perennial; tufted (tussocks very neat); 200–300 mm tall. Leaf blades 30–100 mm long; 0.3–0.5 mm wide. Spikelets 5–7 mm long. Plants without glands; leaves in a tight basal tussock; lemmas awned.

Flowering (anthesis) October. Restricted to limestone pavements. Conservation status not known. Infrequent. Biome: Fynbos. Endemic. Sometimes confused with *P. patuliflora* Rendle, a synonym of *P. cirrhulosa*.

Description: Linder & Ellis 1990 (83). Illustration: Linder & Ellis 1990 (fig. 12). Voucher: Du Toit 1960 (BOL). PRECIS code 9902050–01520.



***Pentaschistis calcicola* Linder var. *hirsuta* Linder**

Perennial; tufted; 200–300 mm tall. Leaf blades to 30 mm long; to 0.5 mm wide (puberulous). Spikelets 6–7 mm long. Plants without glands; lemmas awned.

Flowering (anthesis) September. Restricted to limestone pavements. Conservation status not known. Infrequent. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (83). Voucher: Linder 4366 (BOL). PRECIS code 9902050–01550.



***Pentaschistis capensis* (Nees) Stapf**

Perennial; tangled; 200–350 mm tall. Leaf blades to 120 mm long; to 4 mm wide. Spikelets 6–9 mm long. Glands absent; lemmas with spreading awns, awns not geniculate.

Flowering (anthesis) December and January. Restricted to rocky streams where it grows in



water, often over waterfalls. Locally common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (494), Chippindall 1955 (261), Linder & Ellis 1990 (103). Illustration: Chippindall 1955 (fig. 225.7). Voucher: Esterhuysen 33060 (BOL). PRECIS code 9902050–01600.

***Pentaschistis capillaris* (Thunb.) McClean**

Annual; 80–400 mm tall. Leaf blades to 50 mm long; to 5 mm wide. Spikelets 3 mm long. Plants with stalked glands; lemmas muticous.

Flowering (anthesis) September and October. In coastal sands. Infrequent. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Chippindall 1955 (268), Linder & Ellis 1990 (48). Illustration: Chippindall 1955 (fig. 241). Voucher: Pillans 7938 (BOL). PRECIS code 9902050–01700.



***Pentaschistis caulescens* Linder**

Perennial; tangled; 150–300 mm tall. Leaf blades 30–40 mm long; 1–2 mm wide. Spikelets 8–12 mm long. Glands absent; leaves spreading from aerial stems; lemmas awned, glabrous.

Flowering (anthesis) September to October. On shale bands on dry stony slopes. Conservation status not known. Abundance not known. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (99). Illustration: Linder & Ellis 1990 (fig. 17). Voucher: Esterhuysen 26349 (BOL). PRECIS code 9902050–01720.



***Pentaschistis chippindalliae* Linder**

Perennial; tufted; 300–500 mm tall. Leaf blades to 200 mm long; to 0.5 mm wide. Spikelets 4.5–7.5 mm long. Plants without glands; inflorescence open and fine; lemmas awned.

Flowering (anthesis) February to March. Restricted to sour grassland in highlying ground in the eastern Transvaal, probably restricted to quartzites. Locally common. Biome: Afromontane. Endemic.

Description: Linder & Ellis 1990 (92). Illustration: Linder & Ellis 1990 (fig. 15). Voucher: Linder 4711 (BOL). PRECIS code 9902050–01740.



***Pentaschistis cirrhulosa* (Nees) Linder**

(=*P. angustifolia* (Nees) Stapf var. *cirrhulosa* (Nees) Stapf) 3; (=*P. burchellii* Stapf) 3; (=*P. patuliflora* Rendle) 3.

Perennial; tufted; 150–300 mm tall. Leaf blades 30–70 mm long; 0.5–3.0 mm wide (usually rolled, purplish). Spikelets 5–9 mm long. Stalked glands present on leaf sheaths, pedicels and glumes; lemmas awned.

Flowering (anthesis) October. On sandstone gravels at lower altitudes. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (501, 503), Linder & Ellis 1990 (42). Voucher: Esterhuysen 17189 (BOL). PRECIS code 9902050–01760.



***Pentaschistis colorata* (Steud.) Stapf**

(=*P. colorata* (Steud.) Stapf
var. *polytricha* Stapf) 3.

Perennial; tufted (or cushion-forming, possibly tangled, habit of living plants needs study); 300–600 mm tall. Leaf blades 150–300 mm long; 0.3–1.0 mm wide (usually curly). Spikelets 8–13 mm long. Plants without glands; inflorescence generally with fewer than 20 spikelets; lemmas awned.

Flowering (anthesis) September to December. With a wide ecological range, usually occurs on stony slopes in sandstone derived soils. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (491), Chippindall 1955 (260), Linder & Ellis 1990 (77). Voucher: Esterhuysen 19017 (BOL). PRECIS code 9902050–01800.

***Pentaschistis curvifolia* (Schr.) Stapf**

Fig. 161. Pl. 147.

Perennial; tufted; 400–500 mm tall. Leaf blades to 300 mm long; to 4 mm wide (margins thickened). Spikelets 8–12 mm long. Plants without glands; inflorescence compact, with the pedicels obscured by the ivory-coloured spikelets; lemmas awned.

Flowering (anthesis) October and November. Widespread over wide altitude range, usually in Fynbos on sandstone derived soils. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (491), Chippindall 1955 (258), Linder & Ellis 1990 (96). Illustration: Chippindall 1955 (fig. 226). Voucher: Linder 4793 (BOL). PRECIS code 9902050–02000.

***Pentaschistis densifolia* (Nees) Stapf**

(=*P. densifolia* (Nees) Stapf
var. *intricata* Stapf) 3.

Softly herbaceous perennial; cushion-forming; 90–250 mm tall. Leaf blades to 40 mm long; to 1.5 mm wide (old blades drying pink). Spikelets 3.5–4.5 mm long. Leaf margins with stalked glands; lemmas awned, awn 3–6 mm long.

Flowering (anthesis) December to January. On ledges and in crevices at mid-altitudes on mountains, often growing in moss-beds. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (506), Chippindall 1955 (263), Linder & Ellis 1990 (41). Voucher: Esterhuysen 22595 (BOL). PRECIS code 9902050–02100.

***Pentaschistis ecklonii* (Nees) McClean**

(=*P. bachmannii*
McClean) 3.

Perennial; tufted; 200–300 mm tall. Leaf blades to 60 mm long; to 2 mm wide. Spikelets 3–4 mm long. Plants with stalked glands; inflorescence spikelike; lemmas muticous.

Flowering (anthesis) January to March. Local on 'richer' soils derived from shales or sand in the lowlands. Infrequent. Biome: Fynbos. Endemic.

Description: Chippindall 1955 (267), Linder & Ellis 1990 (52). Illustration: Chippindall 1955 (fig. 239). Voucher: Esterhuysen 24035 (BOL). PRECIS code 9902050–02250.

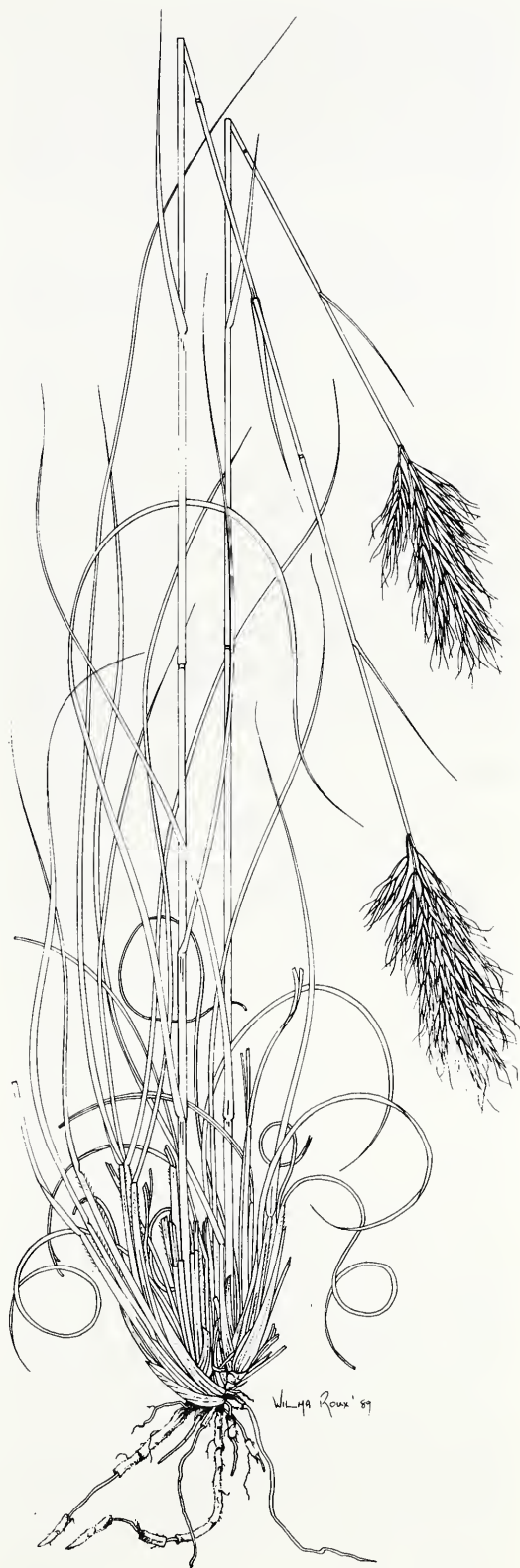


Fig. 161. *Pentaschistis curvifolia*

***Pentaschistis elegans* (Nees) Stapf**

Perennial; tufted; 200–300 mm tall. Leaf blades 20–30 mm long; to 1 mm wide. Spikelets 7–9 mm long. Plants without glands; lemmas sparsely villous at the apex, with the central awn 15 mm long.

Flowering (anthesis) September. In sand on coastal flats. Rare. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (496), Chippindall 1955 (261), Linder & Ellis 1990 (90). Voucher: Henderson 1820 (BOL). PRECIS code 9902050–02300.

***Pentaschistis eriostoma* (Nees) Stapf**

(=*P. juncifolia* Stapf) 3.

Perennial; tufted; 300–900 mm tall. Leaf blades to 400 mm long; to 1.5 mm wide. Spikelets 8–12 mm long. Plants without glands; basal leaf sheaths generally with a dense woolly covering, or sometimes only the sheath apex with wool; lemmas awned.

Flowering (anthesis) September to November. Many habitats. Common. Biome: Fynbos and Succulent Karoo.

Description: Stapf 1898–1900 (489), Chippindall 1955 (260), Linder & Ellis 1990 (106). Illustration: Chippindall 1955 (fig. 227). Voucher: Esterhuysen 27416 (BOL). PRECIS code 9902050–02400.

***Pentaschistis exserta* Linder**

Perennial; tufted (plant base with horizontal stolons); about 600 mm tall. Leaf blades to 300 mm long; to 0.5 mm wide. Spikelets 7.5–8.5 mm long. Glands absent; lemmas awned, lateral awns exserted from the glumes.

Flowering (anthesis) January. Local in seeps and along streams in the montane belt. Locally common. Biome: Afromontane. Endemic. Mostly under *P. tysonii* aff.

Description: Linder & Ellis 1990 (92). Voucher: Ellis 5723 (PRE). PRECIS code 9902050–02650.

***Pentaschistis galpinii* (Stapf) McClean**

Perennial; cushion-forming, the cushions low and rounded, or sometimes the plant with stolons and mat-forming; 150–300 mm tall. Leaf blades 60–180 mm long; 2–5 mm wide (basally aggregated). Spikelets 4–6 mm long. Plants with stalked glands; inflorescence usually contracted, with the basal pedicel segments as long as the spikelets; lemmas awned or muticous.

Flowering (anthesis) January. Alpine grassland, usually in bare patches on wet basalt, alt. 2–3000 m. Common. Biome: Afromontane. Endemic.

Description: Chippindall 1955 (234), Linder & Ellis 1990 (51). Voucher: Linder 4844 (BOL). PRECIS code 9902050–02800.



Pl. 148.

***Pentaschistis glandulosa* (Schrad.) Linder**

(=*P. angustifolia* (Nees) Stapf var. *micrathera* (Nees) Stapf) 3.

Perennial; tufted; 100–350 mm tall. Leaf blades 80–300 mm long; 1–3 mm wide. Spikelets 4.0–5.5 mm long. Leaf blades with sunken glands; lemmas awned.

Flowering (anthesis) October. 'Richer' granite-derived soils. Common. Biome: Fynbos and Savanna. Endemic.

Description: Stapf 1898–1900 (503), Chippindall 1955 (264), Linder & Ellis 1990 (60). Voucher: Linder 4807 (BOL). PRECIS code 9902050–02850.

***Pentaschistis heptamera* (Nees) Stapf**

Perennial; single or several shoots; 200–300 mm tall. Leaf blades to 80 mm long; to 0.5 mm wide. Spikelets 5–6 mm long. Plants without glands; lemmas awned, with 4–6 lateral awns.

Flowering (anthesis) November to December. Restricted to coastal sands. Conservation status not known. Infrequent. Biome: Savanna. Endemic.

Description: Stapf 1898–1900 (504), Chippindall 1955 (262), Linder & Ellis 1990 (106). Illustration: Chippindall 1955 (fig. 225.8). Voucher: Fourcade 1810 (BOL). PRECIS code 9902050–02900.

***Pentaschistis holciformis* (Nees) Linder**

Perennial; tufted; 400–600 mm tall. Leaf blades 150–200 mm long; to 0.5 mm wide. Spikelets 6–7 mm long. Plants without glands; lemmas awned, lateral awns 0.3 mm long.

Flowering (anthesis) March. On sandstone derived soils in the mountains, usually in black soils, often on firebreaks. Locally common (after fires). Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (536), Linder & Ellis 1990 (91). Voucher: Esterhuysen 33498 (BOL). PRECIS code 9902050–03050.

***Pentaschistis lima* (Nees) Stapf**

Perennial; tufted; about 450 mm tall. Leaf blades to 300 mm long; to 0.5 mm wide (tightly rolled). Spikelets 6–7 mm long. Pedicels with stalked glands; lemmas awned.

Flowering (anthesis) November to December. On granitic soils. Conservation status not known. Abundance not known. Biome: Nama-Karoo. Endemic.

Description: Stapf 1898–1900 (498), Linder & Ellis 1990 (44). Voucher: Adamson 1475 (BOL). PRECIS code 9902050–03250.



Pentaschistis longipes Stapf

Perennial; tufted; 250–700 mm tall. Leaf blades to 150 mm long; to 4 mm wide. Spikelets 4.5–5.0 mm long. Margins and glumes with stalked glands; lemmas awned, central awn 7 mm long.

Coastal sands. Conservation status not known. Abundance not known. Endemic.

Description: Stapf 1898–1900 (509), Chippindall 1955 (264), Linder & Ellis 1990 (35). Voucher: Liebenberg 3968 (PRE). PRECIS code 9902050–03400.

Pentaschistis malouinensis (Steud.) Clayton

(=*Achneria capensis* (Steud.) Dur. & Schinz) 2; (= *P. steudelii* McClean) 3.

Perennial; tufted; 150–300 mm tall. Leaf blades to 150 mm long; to 0.5 mm wide. Spikelets 3.5–4.5 mm long. Plants without glands; glume apices brown,



Fig. 162.



shortly puberulous and rounded; lemmas muticous.

Flowering (anthesis) November to January. Widespread in a range of habitats, from sparse vegetation to rock ledges, over a wide altitudinal range, often found in disturbed sites. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (459), Chippindall 1955 (267), Linder & Ellis 1990 (87). Illustration: Chippindall 1955 (fig. 240). Voucher: Esterhuysen 19399 (BOL). PRECIS code 9902050–03500.

Pentaschistis microphylla (Nees) McClean

Perennial; cushion-forming or sometimes mat-forming; about 300 mm tall. Leaf blades to 50 mm long; to 3 mm wide. Spikelets 3 mm long. Plants with stalked glands, especially on the pedicels; leaves broad and stiff, in basal rosettes; lemmas muticous.

Flowering (anthesis) December. Arid montane grassland in the Stormberg, in shallow soils over bedrock at ca. 2000 m. Locally common. Biome: Afromontane. Endemic.

Description: Chippindall 1955 (266), Linder & Ellis 1990 (51). Illustration: Chippindall 1955 (fig. 237). Voucher: Flanagan 1668 (BOL). PRECIS code 9902050–03600.



Pentaschistis montana Linder

Perennial; tufted (mat-forming); 150–200 mm tall. Leaf blades to 40 mm long; to 0.5 mm wide. Spikelets 4.5–5.0 mm long. Plants without glands; leaves basal; lemmas awned, central awn 5–6 mm long.

Flowering (anthesis) November. Stony, arid upper slopes in sandstone mountains. Common. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (83). Illustration: Linder & Ellis 1990 (fig. 13). Voucher: Esterhuysen 35723 (BOL). PRECIS code 9902050–03650.



Pentaschistis natalensis Stapf

Perennial; loosely tufted (forming diffuse tussocks); 400–800 mm tall. Leaf blades to 300 mm long; 1–5 mm wide. Spikelets 6–7 mm long. Glume keels with small rounded glands; lemmas awned.

Flowering (anthesis) November to February. In sour grassland or near forest margins in the montane belt. Infrequent. Biome: Afromontane. To southern Tanzania, and Madagascar.

Description: Stapf 1898–1900 (493), Chippindall 1955 (265), Linder & Ellis 1990 (56). Illustration: Chippindall 1955 (fig. 225.3). Voucher: Du Toit 1174 (BOL). PRECIS code 9902050–03700.



Pentaschistis oreodoxa Schweick.

Perennial; tufted (tends towards cushion formation); 200–500 mm tall. Leaf blades to 300 mm long; to 4 mm wide. Spikelets 4–6 mm long. Plants with stalked glands; lemmas awned, lobes acute.

Flowering (anthesis) January. In sour grassland over a wide altitudinal range. Common. Biome: Afromontane. Endemic.

Description: Chippindall 1955 (265), Linder & Ellis 1990 (57). Voucher: Killick 1300 (BOL). PRECIS code 9902050–03900.



Fig. 162. *Pentaschistis malouinensis*

Pentaschistis pallescens (Schrad.) Stapf

(=*P. sylvatica* Adamson) 3.

Perennial; tufted; 600–1200 mm tall. Leaf blades to 600 mm long; to 8 mm wide. Spikelets 10–12 mm long. Plants without glands or with linear glands restricted to pedicels; leaf blades much darker above than below; lemmas awned.

Flowering (anthesis) November and December. On the lower slopes of sandstone mountains, usually found after fire. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (487), Chippindall 1955 (258), Linder & Ellis 1990 (74). Illustration: Chippindall 1955 (fig. 225.1). Voucher: Esterhuysen 17614 (BOL). PRECIS code 9902050–04000.

**Pentaschistis pallida** (Thunb.) Linder

(=*P. angustifolia* (Nees) Stapf) 3; (=*P. angustifolia* var. *albescens* Stapf) 3; (=*P. filiformis* (Nees) Stapf) 3; (=*P. heterochaeta* Stapf) 3; (=*P. imperfecta* Stapf) 3; (=*P. thunbergii* sensu Stapf) 3.

Perennial; tufted; 150–400 mm tall. Leaf blades 120–200 mm long; 1–5 mm wide. Spikelets 3–5 mm long. Plants usually with stalked glands; inflorescence with numerous spikelets; lemmas awned, lateral awns exserted from the glumes.

Flowering (anthesis) October. Widespread in places with slight to heavy disturbance. Common. Biome: Fynbos and Succulent Karoo. Endemic. This species has seven intergrading morphological forms.

Description: Stapf 1898–1900 (502, 503, 505, 507, 508), Chippindall 1955 (264), Linder & Ellis 1990 (36). Voucher: Esterhuysen 19270 (BOL). PRECIS code 9902050–04150.

**Pentaschistis papillosa** (Steud.) Linder

(=*P. subulifolia* Stapf) 3; (=*P. zeyheri* Stapf) 3.

Perennial; tangled; 100–400 mm tall. Leaf blades 35–100 mm long; 3–6 mm wide. Spikelets 5–7 mm long. Plants with spreading culms; pedicels with stalked glands; lemmas awned, lateral awns usually exserted from the glumes.

Flowering (anthesis) October and November. At low altitudes on sandstones. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (497, 499), Chippindall 1955 (262), Linder & Ellis 1990 (32). Voucher: Leighton 2011 (BOL). PRECIS code 9902050–04250.

**Pentaschistis patula** (Nees) Stapf

(=*P. euadenia* Stapf) 3; (=*P. patula* (Nees) Stapf var. *acuta* Stapf) 3.

Annual; 150–300 mm tall. Leaf blades to 50 mm long; to 3 mm wide. Spikelets 3.5–5.0 mm long. Plants with stalked glands; lemmas awned, the lateral awns included in the glumes.

Flowering (anthesis) September to October. Local in sandy soils at the arid margins of the Fynbos and in Namaqualand. Common. Biome: Fynbos and Succulent Karoo. Endemic.



Description: Stapf 1898–1900 (510), Chippindall 1955 (268, 270), Linder & Ellis 1990 (45). Illustration: Linder & Ellis 1990 (fig. 1). Voucher: Crook 1018 (BOL). PRECIS code 9902050–04300.

Pentaschistis praecox Linder

Perennial; tufted; 300–600 mm tall. Leaf blades to 300 mm long; to 0.5 mm wide. Spikelets 8–11 mm long. Plants without glands; glumes acuminate, golden brown; lemmas awned.

Flowering (anthesis) September. In sour grassland in the montane belt. Infrequent. Biome: Afromontane. Endemic.

Description: Linder & Ellis 1990 (95). Voucher: Gordon Gray 8000 (NU). PRECIS code 9902050–04350.

**Pentaschistis pseudopallescens** Linder

Weakly perennial; tufted; 400–800 mm tall. Leaf blades to 300 mm long; to 6 mm wide. Spikelets 10–12 mm long. Inner surface of the leaves villous, old leaves curling; leaf margins and pedicels with obscure linear glands; lemmas awned, lateral awns as long as the glumes.

Flowering (anthesis) November and December. Along seeps and streams in sand at mid-altitude in the Cape sandstone mountains, after fire. Infrequent. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (72). Illustration: Linder & Ellis 1990 (fig. 9). Voucher: Linder 4483 (BOL). PRECIS code 9902050–04420.

**Pentaschistis pungens** Linder

Biennial; tufted; 200–500 mm tall. Leaf blades to 120 mm long; to 4 mm wide. Spikelets 11–15 mm long. Glands absent; old leaves flat and recurved; lemmas awned, central awn 17–20 mm long.

Flowering (anthesis) September. At higher altitudes, usually in damp sand, after fire. Common. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (97). Illustration: Linder & Ellis 1990 (fig. 16). Voucher: Esterhuysen 13030 (BOL). PRECIS code 9902050–04460.

**Pentaschistis pusilla** (Nees) Linder

(=*Poaagrostis pusilla* (Nees) Stapf) 3.

Perennial (soft, pale green plants); cushion-forming; about 120 mm tall. Leaf blades to 25 mm long; to 1.5 mm wide. Spikelets 2.5–3.0 mm long. Glands absent; spikelets usually single-flowered; lemmas muticous.

Local in damp cool habitats in rock crevices, on ledges, and especially along streams and waterfalls. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (760), Chippindall 1955 (272), Linder 1990 (89). Illustration: Chippindall 1955 (fig. 244). Voucher: Esterhuysen 26945 (BOL). PRECIS code 9902050–04520.



Pl. 149.

***Pentaschistis pyrophila* Linder**

Perennial; tufted; 200–600 mm tall. Leaf blades 60–200 mm long; 0.5–1.5 mm wide (apices sometimes pungent). Spikelets 10–12 mm long. Plants without glands, usually with burnt-off leaf sheaths; lemmas awned.

Flowering (anthesis) November to January. At higher altitudes on stony slopes on sandstones. Common. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (81). Illustration: Linder & Ellis 1990 (fig. 11). Voucher: Esterhuysen 28598 (BOL). PRECIS code 9902050–04550.

***Pentaschistis rosea* Linder subsp. *rosea***

Biennial; tufted; 150–400 mm tall. Leaf blades 50–100 mm long; to 1 mm wide. Spikelets 11–12 mm long. Leaves linear, basal; leaf margins and pedicels with obscure linear glands; glumes often with tufts of cushion-hairs; lemmas awned.

Flowering (anthesis) October. After fire on deep sandy soils. Locally dominant. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (71). Voucher: Esterhuysen 21885 (BOL). PRECIS code 9902050–04670.

***Pentaschistis reflexa* Linder**

Biennial; tufted or tangled; 100–350 mm tall. Leaf blades to 30 mm long; to 1.5 mm wide. Spikelets 3–4 mm long. Plants with stalked glands; spikelets reflexed at anthesis; lemmas mucicous.

Flowering (anthesis) October to December. Local at lower altitudes in arid Fynbos. Conservation status not known. Infrequent. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (53). Illustration: Linder & Ellis 1990 (fig. 7). Voucher: Esterhuysen 17931 (BOL). PRECIS code 9902050–04570.

***Pentaschistis rupestris* (Nees) Stapf**

Perennial; tufted; 600–1000 mm tall. Leaf blades to 400 mm long; to 6 mm wide. Spikelets 7–8 mm long. Plants generally with stalked glands on the leaves and especially on the pedicels; inflorescences usually open, hemispherical; lemmas awned.

Flowering (anthesis) October. Cedarberg, with a wide habitat range, but restricted to sandstone derived soils. Locally common. Biome: Fynbos. Endemic. Previously confused with *P. veneta* Linder.

Description: Linder & Ellis 1990 (34). Voucher: Linder 4468 (BOL). PRECIS code 9902050–04700.

***Pentaschistis rigidissima* Pilg. ex Linder**

Perennial; cushion-forming, sometimes forming 'vegetable hedgehogs'; 100–300 mm tall. Leaf blades 40–200 mm long; 0.5–1.0 mm wide (apices sometimes pungent). Spikelets 6–8 mm long. Plants without glands; panicle slender, almost spikelike; spikelets greenish; lemmas awned.

Flowering (anthesis) September to December. Rock crevices at mid and upper altitudes in the mountains, and in arid habitats. Common. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (85). Illustration: Linder & Ellis 1990 (fig. 14). Voucher: Esterhuyen 12437 (BOL). PRECIS code 9902050–04600.

***Pentaschistis scandens* Linder**

Perennial; tangled, shoots spreading through vegetation; 300–500 mm tall. Leaf blades to 15 mm long; to 0.5 mm wide. Spikelets 10–11 mm long. Plants without glands; leaves flat and spreading from long, scandent, aerial stems; lemmas awned.

Flowering (anthesis) August. In sandy soils on the Bredasdorp plains. Conservation status not known. Infrequent. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (101). Illustration: Linder & Ellis 1990 (fig. 18). Voucher: Linder 4766 (BOL). PRECIS code 9902050–04750.

***Pentaschistis rosea* Linder subsp. *purpurascens* Linder**

Biennial; cushion-forming; 150–400 mm tall. Leaf blades 20–100 mm long; 0.5–3.0 mm wide. Spikelets 8–12 mm long. Leaves cauline; leaf margins and pedicels with obscure linear glands; glumes usually purplish with tufts of cushion-hairs; lemmas awned.

Flowering (anthesis) October to December. At higher altitudes on sandy flats and stony slopes after fire. Common. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990. Voucher: Linder 4403 (BOL). PRECIS code 9902050–04650.

***Pentaschistis setifolia* (Thunb.) McClean**

Perennial; tufted; 150–400 mm tall. Leaf blades to 300 mm long; to 0.8 mm wide (curly). Spikelets 3.5–5.0 mm long. Plants with stalked or sunken glands; lemmas mucicous, often dark-coloured.

Flowering (anthesis) December and January. Sour grasslands over a wide altitudinal range. Dominant. Biome: Afromontane. Endemic. Delimitation from *P. oreodoxa*, *P. glandulosa* and *P. ampla* is difficult.

Description: Chippindall 1955 (266), Linder & Ellis 1990 (58). Illustration: Chippindall 1955 (fig. 233). Voucher: Linder 4860 (BOL). PRECIS code 9902050–04800.



***Pentaschistis tomentella* Stapf**

(=*P. brachyanthera* Stapf) 3.

Perennial; tufted (or cushion-forming); 100–300 mm tall. Leaf blades to 50 mm long; to 3 mm wide. Spikelets 4–5 mm long. Leaf sheaths with distinctive rows of stalked glands; inflorescence compact; lemmas awned, the lateral awns included in the glumes.

Flowering (anthesis) September. Widespread in the higher and cooler parts of Namaqualand. Common. Biome: Nama-Karoo. Endemic.

Description: Stapf 1898–1900 (502, 507), Chippindall 1955 (268), Linder & Ellis 1990 (43). Illustration: Chippindall 1955 (fig. 22.5). Voucher: Taylor 1166 (BOL). PRECIS code 9902050–05600.

***Pentaschistis tortuosa* (Trin.) Stapf**

(=*P. nutans* (Nees) Stapf) 3.

Perennial; tufted (tussock tight); 600–1000 mm tall. Leaf blades to 500 mm long; to 4 mm wide (linear). Spikelets 7–11 mm long. Plants without glands; inflorescence slender, often somewhat tangled and with the apex drooping; lemmas awned.

Flowering (anthesis) October to December. In damp places on mountains and foothills, usually associated with sandstone soils. Common. Biome: mature Fynbos. Endemic.

Description: Stapf 1898–1900 (488), Chippindall 1955 (258, 259), Linder & Ellis 1990 (78). Voucher: Esterhuysen 34035 (BOL). PRECIS code 9902050–05700.

***Pentaschistis trisetia* (Thunb.) Stapf**

Annual; 200–600 mm tall. Leaf blades to 80 mm long; to 4 mm wide. Spikelets 15–18 mm long. Leaf margins and pedicels with obscure linear glands; lemmas awned.

Flowering (anthesis) September and October. On sandy soils below 600 m. Locally common (after fire). Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (495), Chippindall 1955 (261), Linder & Ellis 1990 (69). Illustration: Chippindall 1955 (fig. 229). Voucher: Linder 4297 (BOL). PRECIS code 9902050–05800.

***Pentaschistis tysonii* Stapf**

(=*P. fibrosa*) Stapf 3.

Perennial; tufted (plants often with a basal sheath of fibres); 300–500 mm tall. Leaf blades to 300 mm long; 0.5–2.0 mm wide (rolled). Spikelets 7–9 mm long. Plants without glands; leaves basal; lemmas awned, lateral awns included in the glumes.

Flowering (anthesis) November. Sour grassland on mountain slopes. Common. Biome: Afromontane. Endemic.

Description: Stapf 1898–1900 (493), Chippindall 1955 (261), Linder & Ellis 1990 (90). Voucher: Linder 4833 (BOL). PRECIS code 9902050–05900.



Fig. 163.



Fig. 163. *Pentaschistis tysonii*

Pentaschistis velutina Linder

Perennial; tufted (base somewhat swollen, densely villous and without a rhizome); 300–600 mm tall. Leaf blades to 180 mm long; to 1 mm wide. Spikelets 12–15 mm long. Pedicels with obscure linear glands; lemmas awned.

Flowering (anthesis) October and November. On gravelly plateaus and shale bands in mountains. Infrequent. Biome: Fynbos. Endemic.

Description: Linder & Ellis 1990 (66). Illustration: Linder & Ellis 1990 (fig. 8). Voucher: Linder 4791 (BOL). PRECIS code 9902050–05930.

**Pentaschistis veneta** Linder

Perennial; tufted; 200–400 mm tall. Leaf blades to 100 mm long; to 4 mm wide. Spikelets 5.0–6.5 mm long. Leaf margins with stalked glands; lemmas awned, lateral awns as long as the glumes.

Flowering (anthesis) December to January. In black sand in seeps, at mid to upper altitudes in the Cape sandstone mountains. Common. Biome: Fynbos. Endemic. In many herbaria under *P. rupestris* (Nees) Stapf.

Description: Stapf 1898–1900 (498, as *P. rupestris*), Chippindall 1955 (263, as *P. rupestris*), Linder & Ellis 1990 (29). Voucher: Esterhuysen 15125 (BOL). PRECIS code 9902050–05960.

**Pentaschistis viscidula** (Nees) Stapf

Perennial; geophytic with swollen, villous bases, stolons absent, shoots single or several; 200–500 mm tall. Leaf blades to 100 mm long; to 0.8 mm wide. Spikelets 7–10 mm long. Pedicels sometimes with obscure linear glands; lemmas awned, lateral awns 3 mm long.

Flowering (anthesis) October and November. After fire on sandstone derived soils in the Cape mountains. Common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (486), Chippindall 1955 (258), Linder & Ellis 1990 (68). Voucher: Esterhuysen 29946 (BOL). PRECIS code 9902050–06000.

**Periballia** Trin.

Molineria Parl., *Molineriella* Rouy. Sometimes included in *Deschampsia* P. Beauv.

Annual; caespitose (or culms solitary). Culms 30–250 mm high; herbaceous. Leaf blades linear; flat, or rolled (convolute). Ligule an unfringed membrane.

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets 1.75–2 mm long; compressed laterally; disarticulating above the glumes; with an elongated rachilla internode between the florets. Rachilla terminated by a female-fertile floret. Glumes two; more or less equal; markedly shorter than the spikelets; awnless; similar (membranous). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 2. Lemmas less firm than the glumes (hyaline), or similar in texture to the glumes; incised (irregularly toothed); 3–7 nerved; awnless. Palea

present. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 4$ and 7. Pooideae; Poodae; Aveneae. 3 species. Mediterranean. Xerophytic; in open habitats (dry sandy places). Cape Province. 1 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Tutin. 1980. Fl. Europ. (N.B. - This species treated under *Molineriella* in Fl. Europ., without synonymy).

Species treatment by T.M. Sokutu.

Periballia minuta (L.) Asch. & Graebn.

Annual; loosely tufted; 30–140 mm tall. Leaf blades 7–30 mm long; to 1.5 mm wide. Spikelets 1–2 mm long. Glumes shorter than lemmas; lemmas obtuse or truncate, awnless; palea not keeled, rounded at the back and shorter than the lemmas.



Flowering August to September. Moist shallow soil. Infrequent to locally common. Naturalized from the Mediterranean. Biome: Fynbos. Southern Europe. Weed. May be confused with *Aira cupaniana*, but distinguished by an elongated internode between the florets, a fairly open panicle, glumes that are shorter than the lemmas, and the absence of awns. Collected once in Simonstown in 1943.

Description: Chippindall 1955 (86). Voucher: Salter 8766. PRECIS code 9901870–00100.

Perotis Aiton

Xystidium Trin.

Annual, or perennial (rarely); caespitose. Culms 120–1000 mm high; herbaceous. Ligule an unfringed membrane to a fringed membrane.

Inflorescence a single spike, or a single raceme (a narrow 'bottlebrush', bearded by the long glume awns); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary (often reflexing when mature); subsessile to pedicellate; 1.2–5.5 mm long; compressed laterally; falling with the glumes. Glumes two; more or less equal; long relative to the adjacent lemmas (considerably exceeding them); awned; similar (narrow, membranous to cartilaginous, tipped by long capillary awns). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); 1 nerved; entire; awnless. Palea present; conspicuous but relatively short (but almost equalling the lemma). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small to medium sized (almost as long as the glumes); hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C_4 ; XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 10 species. Africa, India, Ceylon, eastern Asia, Australia. Mesophytic, or xerophytic; in open habitats (savanna and grassland, often ruderal); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal and Cape Province. 3 indigenous species.

References. 1. Clayton. 1971. Kew Bull. 25: 250. 2. Clayton et al. 1974. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Base of spikelet rounded or flat, not elongated into a stipe; awns usually purple; widespread distribution **P. patens**
 Base of spikelet elongated into a narrow tapering stipe; awns usually green; northern Namibia and Botswana 2
 2(1). Spikelets 3.5–5.5 mm long (including stipe); awns 13–25 mm long **P. vaginata**
 Spikelets 2.5–3.0 mm long (including stipe); awns 20–40 mm long **P. leptopus**



Fig. 164. *Perotis patens*

***Perotis leptopus* Pilg.**

Delicate annual; loosely tufted; 250–600 mm tall. Leaf blades 10–40 mm long; 2–5 mm wide. Spikelets 2.5–3.0 mm long. Spikelet base stipitate; awns 20–40 mm long, green (rarely purple-tinged).

Flowering February to March.

Open places in savanna woodland. Conservation status not known. Biome: Savanna. North to Tanzania.

Description: Clayton et al. 1970–1982 (395). Voucher: Joubert & Du Toit 8. PRECIS code 9902800–00100.



***Perotis patens* Gand.**

Bottlebrush grass; purple spike grass.

Short-lived perennial, or annual; loosely tufted; 200–600 mm tall. Leaf blades 10–70 mm long; 3–12 mm wide. Spikelets 1.2–2.7 mm long. Spikelet base flat or rounded, not elongated into a stipe; glumes with purple awns 9–17 mm long.

Flowering throughout the year. Dry, poor or sandy soils, in bare ground and disturbed places. Common. Biome: Savanna and Grassland. Also in tropical Africa and Madagascar. Weed (frequently ruderal).

Description: Chippindall 1955 (109), Clayton et al. 1970–1982 (394). Illustration: Chippindall 1955 (fig. 82). Voucher: Killick & Strey 2458. PRECIS code 9902800–00200.

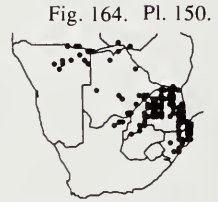


Fig. 164. Pl. 150.

***Perotis vaginata* Hack.**

Annual; loosely tufted; 120–400 mm tall. Leaf blades 10–40 mm long; 1.5–6.0 mm wide. Spikelets 3.5–5.5 mm long. Culms robust; spikelet base stipitate; awns 13–25 mm long, green.

Flowering February to April. Open savanna, in sandy soil. Conservation status not known.

Biome: Savanna. North to Zaire and Tanzania.

Description: Clayton et al. 1970–1982 (397). Voucher: De Winter & Wiss 4342. PRECIS code 9902800–00300.



***Phacelurus* Griseb.**

Pseudophacelurus (Steud.) A. Camus.

Perennial. Culms 200–600 mm high; herbaceous (robust, tough); unbranched above. Leaf blades linear; flat, or folded (or rarely terete). Ligule an unfringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (pedicellate spikelets usually smaller or vestigial), or homomorphic.

Inflorescence of spike-like main branches (usually terminal, of flattened 'racemes' (rarely solitary, or on elongated axis)); digitate or subdigitate (usually); espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (spicate); clustered (on a common axis, rarely solitary); with substantial rachides (clavate or inflated); disarticulating at the joints. 'Articles' with a basal callus-knob.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the



Fig. 165. *Phacelurus franksae*

rachis (not articulated, by contrast with *Pseudovossia*). The sessile spikelets hermaphrodite. The pedicellate spikelets hermaphrodite (rarely), or male-only, or sterile. Female-fertile spikelets compressed dorsiventrally (dorsally flat, convex or rarely concave); falling with the glumes. *Hairy callus absent (callus truncate, minute)*. Glumes two; more or less equal; awnless; very dissimilar (leathery to membranous: G1 2-keeled, flat, G2 cymbiform). *Proximal incomplete florets 1*; male, or sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire; awnless. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonaceae; Andropogoneae; Rottboelliinae. 7 species. Africa to Indo-China and Japan. Helophytic to mesophytic; in shade, or in open habitats (woodland and grassland, in moist places); glycophytic. Natal. 1 indigenous species.

References. 1. Clayton. 1978. Kew Bull. 33: 175.

Species treatment by G.E. Gibbs Russell.

***Phacelurus franksae* (J.M. Wood) Clayton**

(=*Ischaemum franksae* J.M. Wood) 1.

Fig. 165. Pl. 151.



Perennial; tufted; 200–600 mm tall. Leaf blades setaceous or to 1 mm wide. Spikelets (sessile) 6–8 mm long. Lower glumes with short stiff tubercle-based hairs on the prominent nerves; pedicels and rachis internodes swollen.

Flowering October to January. Mountain grassland, in burned veld, alt. 1700–2600 m. Rare. Biome: Afrotropical. The spikelets are superficially similar to those of *Andropogon brazzae*.

pindall 1955 (fig. 399). Voucher: Killick 1070. PRECIS code 9900180–00100.

***Phalaris* L.**

Baldingera Gaertn., Meyer & Scherb., *Digraphis* Trin., *Endallex* Raf., *Phalaridantha* St-Lager, *Phalaroides* Wolf, *Typoides* Moench.

Annual, or perennial; long-rhizomatous, or caespitose, or decumbent (some species reedlike). Culms 100–2000 mm high; herbaceous; unbranched above. Leaf blades linear to linear-lanceolate; flat. *Ligule an unfringed membrane*. *Plants bisexual, with bisexual spikelets*. The spikelets of sexually distinct forms on the same plant (rarely), or all alike in sexuality.

Inflorescence paniculate; open (rarely), or contracted; *espatheate*. *Spikelet-bearing axes persistent*.

Female-fertile spikelets 3.5–9.5 mm long; compressed laterally (strongly); disarticulating above the glumes, or falling with the glumes, or not disarticulating. *Glumes two; more or less equal*; about equalling the spikelets to much exceeding the spikelets; awnless; similar (papery). *Proximal incomplete florets usually 1 or 2*.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; entire; 5 nerved; awnless. *Palea* present; relatively long; *keel-less*. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum long-linear; embryo large (up to a third of the grain), or small.

Cytology, classification, distribution. Chromosome base number, $x = 6$ and 7. Pooideae; Pooideae; Aveneae. 16 species. North temperate, South America. Helophytic, or mesophytic; in open habitats (in weedy places, damp soils and swamps). Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. 6 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Anderson. 1961. Iowa State J. Sci. 36: 1.

Species treatment by M. Koekemoer.

- 1(0). Fertile spikelet surrounded by six sterile spikelets, often reduced to clavate knobs; spikelets falling in groups of seven; fertile floret glabrous or with only a few hairs at the base of the sterile florets; sterile florets reduced (0.1–0.2 mm long) . ***P. paradoxa***
Fertile spikelets without surrounding sterile spikelets; spikelets falling individually or in variable groups with more than one fertile spikelet; fertile floret densely or sparsely pubescent; sterile florets usually at least 1/3 as long as fertile florets. . . . 2
2(1). Sterile floret one, well developed or reduced, rarely

- with also a much reduced second floret shorter than 0.5 mm 3
Sterile florets two, more or less equal 4
3(2). Plants annual; sterile floret either reduced to 0.3 mm or 1.0–1.8 mm long; glume wings usually toothed or erose **P. minor**
Plants perennial; sterile floret well developed, 1.0–2.2 mm long, rarely with a second floret less than 0.5 mm long; glume wings usually entire **P. aquatica**
4(2). Glumes broadly winged, wing broadening upwards; sterile florets 2.5–4.5 mm long ... **P. canariensis**
Glumes wingless or very narrowly winged, wing of even width throughout; sterile florets 0.7–2.3 mm long 5
5(4). Glumes abruptly tapering at the tips, winged; panicle narrowly cylindrical, 6–12 mm wide; spikelets tightly appressed to the central axis; sterile florets 0.7–1.5 mm long **P. angusta**
Glumes gradually tapering to the tips, wingless; panicle broadly cylindrical, often tapering to the tip and interrupted at the base, 10–30 mm wide; spikelets loosely appressed to the central axis; sterile florets 1.2–2.3 mm long . **P. arundinacea**

Fig. 166. *Phalaris aquatica****Phalaris angusta* Nees ex Trin.**

Annual; tufted; to 1500 mm tall. Leaf blades 50–300 mm long; 3–12 mm wide. Spikelets 2.9–5.5 mm long. Panicle 60–150 mm long, 6–12 mm wide, narrowly cylindrical; glumes very narrowly winged, tapering abruptly to the tip; female-fertile floret densely pubescent, sterile florets two, 0.7–1.5 mm long.

Flowering September to December. An adventive in cultivated and fallow lands. Infrequent. Naturalized from South America. Biome: Fynbos and Savanna. North and South America. Weed.

Description: Anderson 1961 (61), Chippindall 1955 (90). Voucher: Salter 9054. PRECIS code 9901630–00100.

***Phalaris aquatica* L.**

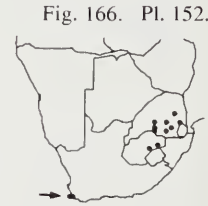
(= *P. nodosa* L.) 2; (= *P. tuberosa* L.) 2.

Towoomba Canary grass.

Perennial; loosely tufted (lateral culms geniculate ascending); 500–1500 mm tall. Leaf blades 180–350 mm long; 2–15 mm wide. Spikelets 4.5–7.5 mm long. Panicle 15–110 mm long, 10–25 mm wide, occasionally interrupted at the base; glumes broadly winged, margin entire; female-fertile floret densely pubescent; sterile floret usually one, 0.2–2.2 mm long (rarely with a second sterile floret, which is then shorter than 0.5 mm).

Flowering November to April. Wet ground by streams and channels or as a weed in moist fields. Locally common. Naturalized from the Mediterranean region. Biome: Fynbos and Grassland. Mediterranean region eastwards to Iraq. Introduced and cultivated in India, Africa, Australia and North America. Planted winter pasture.

Description: Anderson 1961 (43), Bor 1985 (1773), Chippindall 1955 (90), Clayton et al. 1970–1982 (97). Illustration: Chippindall 1955 (fig. 60). Voucher: Oliver 6207. PRECIS code 9901630–00200.

***Phalaris arundinacea* L.**

Reed Canary grass.

Perennial; rhizomatous (rhizomes scaly, creeping); 600–1500 mm tall. Leaf blades 50–200 mm long; 5–15 mm wide. Spikelets 3.5–7.5 mm long. Panicle 70–160 mm long, 10–30 mm wide, often interrupted in the lower part; glumes wingless, gradually tapering to the tip; female-fertile floret sparsely pubescent; sterile florets two, 1.2–2.3 mm long.

Flowering November to April. Marshes, river banks, swamp margins and damp hollows in upland areas. Locally common. Naturalized from northern U.S.A. Biome: Grassland. Introduced worldwide. The var. *picta* L. has striped leaves and is planted in gardens as an ornamental.

Description: Anderson 1961 (37), Stapf 1898–1900 (683), Hitchcock & Chase 1950 (534), Chippindall 1955 (89), Clayton et al. 1970–1982 (95). Illustration: Chippindall 1955 (fig. 59), Clayton et al. 1970–1982 (fig. 32), Hitchcock & Chase 1950 (fig. 1128). Voucher: Devenish 1387. PRECIS code 9901630–00300.



Phalaris canariensis L.

Common Canary grass.

Annual; tufted (culms usually fascicled, erect or geniculately ascending); 300–600 mm tall. Leaf blades 100–260 mm long; 3–12 mm wide. Spikelets 7–8 mm long. Panicle 15–40 mm long, 10–15 mm wide; glumes prominently winged, wing broadening upwards; female-fertile floret pilose; sterile florets two, more or less equal, 2.5–4.5 mm long, broad and somewhat chaffy.



Flowering October to December. Ruderals of disturbed areas such as waste places, road verges, cultivated lands and pastures. Locally common. Naturalized, possibly a native of northwest Africa and the Canary Islands. Biome: Fynbos and Grassland. Cultivated in many countries. Commercially cultivated seed for cage birds, weed. Very similar to *P. minor*, which has a single sterile floret and a much narrower wing on the glume.

Description: Anderson 1961 (57), Bor 1985 (1771), Chippindall & Crook 1976 (228), Hitchcock & Chase 1950 (531), Chippindall 1955 (90). Illustration: Hitchcock & Chase 1950 (fig. 1118). Voucher: Dryfhout 701. PRECIS code 9901630–00500.

Phalaris minor Retz.

Small Canary grass.

Annual; loosely tufted (culms erect or geniculately ascending); (10–)200–1000 mm tall. Leaf blades 50–250 mm long; 5–10 mm wide. Spikelets 4–6 mm long. Panicle 20–50 mm long, 10–15 mm wide; glumes evenly winged, keel denticulate-undulate; female-fertile florets pilose; sterile floret one, 1.0–1.8 mm long (occasionally 0.2–0.3 mm long).



Flowering September to January. Disturbed areas such as cultivated and fallow lands, roadsides and waste places, often in damp situations. Locally common. Naturalized from the Mediterranean. Biome: Fynbos, Grassland, Nama-Karoo, and Succulent Karoo. Introduced weed in most temperate regions and in the tropics. Ruderal weed. Very similar to *P. canariensis*, which has two sterile florets and broader glume wings.

Description: Anderson 1961 (31), Bor 1985 (1772), Chippindall & Crook (228), Stapf 1898–1900 (682), Hitchcock & Chase 1950 (532), Chippindall 1955 (90). Illustration: Chippindall 1955 (fig. 61), Hitchcock & Chase 1950 (fig. 1121). Voucher: Retief & Reid 483. PRECIS code 9901630–00600.

Phalaris paradoxa L.

(=*P. paradoxa* L. var. *praemorsa* Coss. & Dur.) 2.

Annual; tufted (culms fascicled, erect or geniculately ascending); 300–600(–1000) mm tall. Leaf blades 50–300 mm long; 2–6 mm wide. Spikelets 5.5–8.2 mm long. Panicle 20–70 mm long, 10–25 mm wide, often enclosed in an inflated leaf sheath; spikelets borne and falling in units of 6–7 with one female-fertile spikelet surrounded by 5–6 sterile spikelets, often reduced to clavate knobs; female-fertile spikelets with reduced sterile florets.



Flowering August to November. In moist, often poorly drained soils near ponds or irrigation channels, also in cultivated and fallow lands. Rare. Naturalized from the

Mediterranean. Introduced and naturalized in many temperate regions worldwide.

Description: Anderson 1961 (22), Bor (1772), Hitchcock & Chase 1950 (530), Chippindall 1955 (89). Voucher: P.C.V. du Toit 1867. PRECIS code 9901630–00700.

Phragmites Adans.

Czernya Presl, *Miphragtes* Nieuwland, *Oxyanthe* Steud., *Trichoon* Roth, *Xenochloa* Roem. & Schult.

Perennial; long-rhizomatous and long-stoloniferous (reeds, often forming dense stands). Culms 600–4000 mm high (–10 000 mm); woody and persistent to herbaceous (often somewhat persistent); branched above (especially when main culm damaged), or unbranched above. Sheath margins free. Leaf blades linear-lanceolate to lanceolate; flat, or rolled (convolute). Ligule a fringe of hairs.

Inflorescence paniculate; open (200–600 mm long, plumose, the fertile lemmas surrounded by long white silky hairs); espatheate. Spikelet-bearing axes persistent.

Spikelets not in distinct 'long-and-short' combinations; 9–16 mm long; compressed laterally; disarticulating above the glumes (at least above the L1). Glumes two; very unequal; markedly shorter than the spikelets; awnless; similar (membranous). Incomplete florets both distal and proximal to the female-fertile florets. Distal incomplete florets merely underdeveloped. Proximal incomplete florets 1, paleate, male. The proximal lemmas awnless.

Female-fertile florets (2–)3–10. Lemmas similar in texture to the glumes (membranous); hairless; 1–3 nerved; entire; awnless, or awned (narrow-attenuate, mucicous to aristulate). Awns (if lemmas aristulate) 1; median; apical; non-geniculate; much shorter than the body of the lemma. Palea present; conspicuous but relatively short; 2-nerved. Lodicules 2; fleshy; ciliate, or glabrous. Stamens 3 (or two in the lower floret). Ovary glabrous. Fruit small; hilum short; pericarp fused; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 12$. Arundinoideae; Arundineae. 3 species. Cosmopolitan. Helophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 2 indigenous species.

References. 1. Clayton. 1970. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Leaf blades with tips attenuate, flexuous; leaves deciduous at base of blade, leaving sheaths behind on culm; upper glume 6–9 mm long . **P. australis**
 Leaf blades with tips sharp and pungent; leaves deciduous at base of sheath, old culms therefore bare; upper glume 3–5 mm long . **P. mauritanus**

Phragmites australis (Cav.) Steud.

(=*P. communis* Trin.) 1.

Perennial; long rhizomatous; 600–4000 mm tall. Leaf blades to 350 mm long; to 35 mm wide. Spikelets 10–18 mm long. Robust, culms solitary, not tillering; leaves cauline, deciduous at base of blade; leaves with long tapering ligule with fringing hairs; hairs equaling or longer than membranous base; inflorescences compact, 120–400 mm long; upper glume 5–9 mm long; lemmas glabrous.

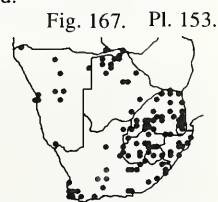




Fig. 167. *Phragmites australis*

Flowering December to June. Riverbeds and wet places. Common, or locally dominant (in riverbeds). Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Desert. Cosmopolitan. Domestic use (basketry).

Description: Chippindall 1955 (228). Illustration: Chippindall 1955 (fig. 202). Voucher: Burtt Davy H610. PRECIS code 9902140-00100.

Phragmites mauritianus Kunth

Perennial; long-rhizomatous, to 5000 mm tall. Leaf blades to 300 mm long; to 30 mm wide. Spikelets 7–15 mm long. Robust, culms tillering from lower nodes; leaves cauline, deciduous at base of sheath; blades, with sharp, rigid tips; ligule with fringing hairs equaling or longer than membranous base; inflorescence broad and lax, 200–400 mm long; upper glume 3–5 mm long; lemmas glabrous.



Flowering January to June. River beds. Common, or locally dominant (in riverbeds). Biome: Savanna, Grassland, and Desert. Tropical Africa. Domestic use (basketry).

Description: Chippindall 1955 (229). Voucher: Galpin 13534. PRECIS code 9902140-00200.

Poa L.

Arctopoa (Griseb.) Probat., *Neuropoa* Clayton, *Oreopoa* Grand., *Paneion* Lunell, *Parodiocloa* C.E. Hubb., *Poagrostis* Raf.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 40–1500 mm high; herbaceous; unbranched above. Sheath margins joined, or free. Leaf blades linear, or linear-lanceolate (often ending in a boat-shaped tip); nearly always narrow; flat, or folded (or canaliculate), or rolled (involute or convolute). Ligule an unfringed membrane, or a fringed membrane (rarely).

Inflorescence paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets not secund; 2–11 mm long; compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; markedly shorter than the spikelets; decidedly shorter than the adjacent lemmas; awnless; similar (membranous). Lower glume 1 nerved, or 3 nerved. Upper glume 3 nerved (usually). All florets female-fertile, or distal incomplete florets also present, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2–10(–15) (very rarely only one). Lemmas similar in texture to the glumes; 5 nerved (usually), or 7–11 nerved (rarely; e.g. in the Australian *Neuropoa*); entire; pointed; awnless (except in the southern South American *P. flabellata*, which has a 2mm terminal awn). Palea present; relatively long, or conspicuous but relatively short, or very reduced. Lodicules 2; membranous; nearly always glabrous (occasionally ciliolate). Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Poeae. About 500 species. Cosmopolitan. Helophytic (rarely), or mesophytic (mostly), or xerophytic (rarely); in shade and in open habitats (typically in grasslands and meadows); mostly glycophytic, or maritime-arenicolous (a few, e.g. *P. macrantha*, *P. confinis*). Namibia, Transvaal, Orange Free State, Swaziland, Natal, Lesotho and Cape Province. Indigenous species (3), naturalized species (3).

References. 1. Chippindall. 1955. Gr. & Past. 2. Author. 1980. Fl. Europ. 3. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.

Fig. 168. *Poa annua*

- 1(0). Spikelets viviparous, parts much distorted, often enlarged and elongated; culms bulbous at the base ***P. bulbosa***
Spikelets not viviparous, parts normal; culms not bulbous at the base 2
- 2(1). Panicle linear to subspiciform, branches solitary, appressed to the central axis, usually more than their own length apart; branches with spikelets over the whole length ***P. leptoclada***
Panicle ovate to pyramidal, branches solitary or in fascicles of up to 6, spreading slightly or horizontally from the central axis, less than their own length apart; branches with spikelets in the upper 1/2 3
- 3(2). Plants annual or biennial; leaves flaccid; anthers shorter than 1 mm ***P. annua***
Plants perennial; leaves firm; anthers longer than 1 mm 4
- 4(3). Lemmas glabrous or sparsely ciliate at the base; panicle with lowest branches solitary or paired; plants rhizomatous, rhizomes oblique; basal sheaths splitting into fibres ***P. binata***

Lemmas woolly at the base; panicle with lowest branches whorled; plants rhizomatous or stoloniferous; basal sheaths usually not fibrous . 5

5(4). Plants rhizomatous; rhizomes stout, smooth, creeping; ligules truncate, to 2 mm long; lemma pilose on keel and marginal veins ***P. pratensis***
Plants stoloniferous; stolons leafy and slender; ligules ovate or oblong-acute, 4–6 mm long; lemma pilose on keel only ***P. trivialis***

***Poa annua* L.**

Annual bluegrass.

Annual (sometimes biennial); loosely or compactly tufted (culms usually geniculate at the base); 25–300 mm tall. Leaf blades 20–50(–140) mm long; 1–5 mm wide. Spikelets 4–6 mm long. Leaf blades flaccid; panicle roughly pyramidal, 10–120 mm long; branches solitary or paired, spreading horizontally or almost so at maturity; spikelets aggregated in upper 1/2 of branches, 3–5-flowered; anthers 0.6–0.8 mm long.

Flowering throughout the year (usually in the rainy season of a particular region). Damp places on roadsides, gardens and waste land or other disturbed areas. Common. Naturalized from Europe. Biome: Fynbos, Savanna, Grassland, and Desert. Europe and Mediterranean region eastwards to India and central Asia, introduced worldwide. Weed (in moist disturbed places). Other *Poa* species in our area are perennial and have longer anthers.

Description: Bor 1985 (1745), Linder (46), Stapf 1898–1900 (715), Hitchcock & Chase 1950 (105), Chippindall 1955 (53), Clayton et al. 1970–1982 (49). Illustration: Chippindall 1955 (fig. 22), Hitchcock & Chase 1950 (fig. 167). Voucher: Smook 3576. PRECIS code 9904070–00100.

Fig. 168. Pl. 154.

***Poa binata* Nees**

(=*P. atherstonei* Stapf) 3;
(=*P. heterogama* Hack.) 3.

Perennial; rhizomatous (rhizome oblique), or tufted; 150–600 mm tall. Leaf blades 30–200 mm long; 1–5 mm wide. Spikelets 4–6 mm long. Old leaf sheaths split into fibres; panicle ovate to pyramidal, 50–150 mm long, branches solitary or binate, less than their own length apart; spikelets aggregated on the upper 1/2 of the branches, 3–5-flowered; lemmas glabrous at the base.

Flowering September to May. Along mountains and escarpment in moist areas. Common. Biome: Grassland and Nama-Karoo. Northwards into Zimbabwe. Very closely related to *P. pratensis* and *P. trivialis*, which have lemmas woolly at the base.

Description: Linder (50), Stapf 1898–1900 (714), Chippindall 1955 (53). Illustration: Chippindall 1955 (fig. 23). Voucher: Stirton 5421. PRECIS code 9904070–00400.

***Poa bulbosa* L.**

(=*P. vivipara* (L.) Willd.) 3.

Bulbous bluegrass.

Perennial; tufted; 150–300 (–500) mm tall. Leaf blades 20–90(–150) mm long, filiform; 1–2 mm wide. Spikelets 4–6 mm long. Roots fibrous; culms



bulbous at the base, covered with scarious remains of old sheaths; most leaves basal, much longer than those along the culm; ligule 4–6 mm long; spikelets 3–6-flowered, nearly always viviparous with distorted and enlarged floret parts; lemmas sparsely scabrid on the keels, 3–5(–7) mm long, developing into a leaf in the older florets; anthers 1.0–1.5 mm long.

Flowering July to November. On gravelly well-drained soils in damp situations such as streambanks and around seasonal pans. Infrequent to locally common. Biome: Nama-Karoo and Succulent Karoo. Possibly endemic and introduced to Europe and western Asia. The viviparous spikelets easily distinguish this species from other *Poa* species in our area.

Description: Bor 1985 (1741), Linder (47), Stapf 1898–1900 (712), Hitchcock & Chase 1950 (123), Chippindall 1955 (53). Illustration: Chippindall 1955 (fig. 21), Hitchcock & Chase 1950 (fig. 213). Voucher: C.M. van Wyk 1407. PRECIS code 9904070–00450.

Poa leptoclada A. Rich.

Perennial; straggling or compactly tufted; 200–600 mm tall. Leaf blades 20–120 mm long, filiform; 0.5–4.0 mm wide. Spikelets 3.0–4.5(–6.0) mm long. Lower leaf sheaths sometimes fibrous; panicle linear to subspiciform, 50–190 mm long, branches solitary, appressed to central axis, usually more than their own length apart; spikelets 2–5-flowered, borne throughout the length of the branches; anthers 0.5–1.0 mm long.

Flowering around July. Wet places in the Drakensberg range. Extremely rare. Biome: Grassland. Northwards on the tropical African mountains to Ethiopia and Cameroun. The panicle is very different from other *Poa* species, which have branches less than their own length apart and spikelets in the upper half.

Description: Linder (52), Clayton et al. 1970–1982 (47). Voucher: Hilliard & Burtt 17708 (NU). PRECIS code 9904070–00550.

Poa pratensis L.

(=*P. bidentata* Stapf) 3.

Kentucky bluegrass, meadow grass.

Perennial; loosely to compactly tufted, or rhizomatous (rhizome long and wiry); 250–600 (–800) mm tall. Leaf blades 60–250 mm long; 2–5 mm wide. Spikelets 3.0–5.5 mm long. Ligules truncate, to 2 mm long; panicle ovate, 50–200 mm long, lowest branches whorled; spikelets 2–5-flowered, aggregated on the upper part of branches; lemma keel and marginal veins pilose; anthers 1.5–2.0 mm long.

Flowering September to January (and April). Moist shady areas, usually in mountains. Locally common. Naturalized from Europe. Biome: Fynbos and Grassland. From Europe and Mediterranean region eastwards to central Asia, introduced elsewhere. Valuable pasture (cultivated to a limited extent), or ornamental (as lawns, but needs fertile soil and plenty of moisture). Closely related to *P. binata*, which has lemmas glabrous or sparsely ciliate on the keel and the lowest panicle branches solitary or paired, and to *P. trivialis*, which is stoloniferous, has ligules longer and lemmas pilose on the keels only.

Description: Bor 1985 (1744), Linder (49), Hitchcock & Chase 1950 (112), Chippindall 1955 (51). Illustration: Hitchcock & Chase 1950 (fig. 181). Voucher: Devenish 1158. PRECIS code 9904070–00600.

Poa trivialis L.

Roughstalk bluegrass.



Perennial; loosely tufted (spreading from a decumbent base), or rhizomatous (stolons creeping and leafy); 200–900 mm tall. Leaf blades 50–150 mm long; 1–5 mm wide. Spikelets 4–5 mm long. Ligule ovate or oblong-acute, 4–6 mm long; panicle ovate or pyramidal, 75–200 mm long, lowest branches whorled; spikelets 3–5-flowered, aggregated on upper part of branches; lemma pilose on keel only; anthers about 1.5 mm long.

Flowering December and March. Moist disturbed places. Rare. Naturalized from Europe. Biome: Grassland. Temperate areas worldwide. Closely related to *P. binata*, which has lemmas glabrous or sparsely ciliate and lowest panicle branches solitary or binate, and to *P. pratensis*, which is rhizomatous, has shorter ligules and lemmas that are pilose on the keels and marginal veins.

Description: Bor 1985 (1743), Linder (48), Stapf 1898–1900 (714), Hitchcock & Chase 1950 (116). Illustration: Hitchcock & Chase 1950 (fig. 190). Voucher: Meredith PRE34056. PRECIS code 9904070–00650.

Pogonarthria Stapf

Annual, or perennial; caespitose. Culms 130–2500 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat, or rolled (convolute). Ligule a fringed membrane, or a fringe of hairs.

Inflorescence of spike-like main branches (a raceme of numerous, up-curved, spike-like branches); non-digitate (the branches tending to whorls); espatheate. Spikelet-bearing axes disarticulating; falling entire (the racemes falling after the spikelets have broken up).

Spikelets solitary; biseriate; 3.3–7.8 mm long; compressed laterally; disarticulating above the glumes; not disarticulating between the florets, or disarticulating between the florets (disarticulating between the lemmas, or the glumes and lemmas falling irregularly to leave the paleas on the persistent rachilla). *Glumes* two: *very unequal (G1 about 2/3 of G2)*; markedly shorter than the spikelets; awnless; similar (rigidly membranous). Incomplete florets distal to the female-fertile florets, merely underdeveloped, awnless; proximal incomplete florets absent.

Female-fertile florets 2–8 (decreasing in size upwards). Lemmas similar in texture to the glumes; without a germination flap; 3 nerved; entire; awnless (but sometimes subaristate). Palea present; relatively long. Lodicules 2; fleshy (but narrow); glabrous. Stamens 3. Ovary glabrous. Fruit small (0.5–1 mm long); ellipsoid; hilum short; pericarp fused; embryo large (about 1/2 grain length).

Photosynthetic pathway and related features. *C4*; *XyMS+*. PCR sheath outlines uneven to even (more even in *P. fleckii* than in *P. squarrosa*). PCR sheath extensions present, or absent. Maximum number of extension cells when present 1. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chloridoideae *sensu lato*. 4 species. Tropical and southern Africa. Mesophytic to xerophytic; in open habitats (savanna grasslands, often in shallow or sandy soils or in disturbed places); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 3 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.



- 1(0). Plants perennial, sometimes with a short rhizome; racemes ascending or spreading, often falcately curved upwards; spikelets 4–10-flowered; lower glume 0.8–1.5 mm long; upper glume 1.6–2.3 mm long ***P. squarrosa***



Fig. 169. *Pogonarthria squarrosa*

Plants annual, tufted; racemes spreading up to 90 degrees from the main axis, seldom falcately curved; spikelets 4–6-flowered; lower glume 1.2–3.2 mm long; upper glume 2.4–3.2 mm long

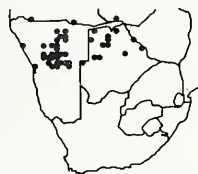
- 2(1). Plants densely tufted, decumbent, not robust, culms and leaves hairy; spikelets 4–5-flowered; lower glume 1.2–2.3 mm long; upper glume 2.4–3.2 mm long; known from Namibia and elsewhere

..... ***P. fleckii***

Plants loosely tufted, erect, robust; culms and leaves glabrous; spikelets 5–6-flowered; lower glume 2.1–3.2 mm long; upper glume 3.2–4.8 mm long; known only from Namibia. ***P. leiarthra***

***Pogonarthria fleckii* (Hack.) Hack.**

Annual; densely tufted; 130–420 mm tall. Leaf blades 60–180 mm long; 3–6 mm wide. Spikelets 5–10 mm long. Vegetative parts covered with bulbous-based hairs; spikelets 4–5-flowered; lower glume 1.2–2.4 mm long; upper glume 2.4–3.2 mm long.

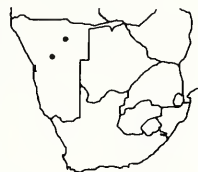


Flowering March to May. Sandy or well-drained soil in open bush or mopane veld, often in disturbed areas. Common. Biome: Savanna and Desert. Zimbabwe.

Description: Launert 1970 (160:153), Chippindall 1955 (185). Voucher: Seydel 4290. PRECIS code 9903340-00100.

***Pogonarthria leiarthra* Hack.**

Annual; loosely tufted; 250–800 mm tall. Leaf blades 70–200 mm long; 3–4 mm wide. Spikelets 5–8 mm long. Culms and leaves glabrous; spikelets 5–6-flowered; lower glume 2.1–3.2 mm long; upper glume 3.2–4.8 mm long.



Flowering February to March.

Red sand. Rare. Biome: Savanna. This species looks like a more robust and glabrous form of *P. fleckii*.

Description: Launert 1970 (160:153), Hackel 1912 Mitt. bot. Mus. Univ. Zurich. Jahr. 57, Chippindall 1955 (185). Voucher: Schoenfelder S.575. PRECIS code 9903340-00200.

***Pogonarthria squarrosa* (Roem. & Schult.) Pilg.**

Fig. 169. Pl. 155.

Herringbone grass, sekelgras.

Perennial; tufted (or with a short rhizome); 270–1400 mm tall. Leaf blades 40–330 mm long; 2.0–5.5 mm wide. Spikelets 3.3–7.8 mm long. Leaf sheaths glabrous, racemes usually falcately curved upwards; spikelets 4–10-flowered; lower glume 0.8–1.5 mm long; upper glume 0.8–1.5 mm long.



Flowering November to May. Open veld or under trees, in light sandy soil, often in disturbed places. Common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical Africa. Occasional weed.

Description: Chippindall & Crook 1976 (175), Launert 1970 (160:154), Chippindall 1955 (185), Clayton et al. 1970–1982 (267). Illustration: Chippindall 1955 (fig. 159), Clayton et al. 1970–1982 (fig. 73). Voucher: Smook 2639. PRECIS code 9903340-00300.

Polevansia De Winter

Perennial; long-rhizomatous and long-stoloniferous (mat-forming, with long decumbent stems). Culms 40–450 mm high; herbaceous; unbranched above. Leaf blades linear to linear-lanceolate; flat. *Ligule a fringed membrane (minutely fimbriate)*.

Inflorescence of spike-like main branches (of appressed racemes, 20–30 mm long); contracted; espatheate. Spikelet-bearing axes 'racemes'; persistent.

Spikelets solitary; pedicellate; 3.5–4.5 mm long; compressed dorsiventrally; disarticulating above the glumes. Glumes two; very unequal; long relative to the adjacent lemmas (i.e., the upper glumes); awnless; very dissimilar (G1 hyaline-membranous, nerveless, obtuse, G2 lanceolate, firmly membranous, 1 nerved). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas similar in texture to the glumes (cf. G2); without a germination flap; 3 nerved; entire; shortly mucronate. Palea present; relatively long (narrowly elliptic, nearly equalling the lemma). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous.

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions absent. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 1 species. South Africa. Mesophytic; in open habitats (mountain grassland); glycophytic. Orange Free State, Lesotho, and Cape Province. 1 indigenous species.



Fig. 170. *Polevansia rigida*

References. 1. De Winter. 1966. *Bothalia* 9: 130.

Species treatment by M. Koekemoer.

Polevansia rigida De Winter

Mat-forming perennial; stoloniferous; 100–410 mm tall. Leaf blades 10–30 mm long; 1.5–2 mm wide. Spikelets 3.5–4.5 mm long. Leaf sheaths loose and overlapping; spikelets dorsally compressed, callus short, obtuse; glumes persistent, unequal, with a single thick central nerve; lemma subcoriaceous, acute and awnless.

Flowering February to May. On lands worn out by traditional pastoralism, or on rocky outcrops, often near water; at altitudes higher than 1250 m. Locally common. Biome: Grassland. Very closely related to *Willkommia*, which has a longer, pungent callus and the lemma thinly membranous, acute or obtuse, mucronate.

Description: De Winter 1966 (130). Voucher: Killick 1983. PRECIS code 9903101–00100.



Polypogon Desf.

Chaetotropis Kunth, *Nowodworskya* Presl., *Raspailia* Presl., *Santia* Savi.

Annual, or perennial; long-stoloniferous, or caespitose. Culms 20–1200 mm high; herbaceous. Leaf blades linear to linear-lanceolate; flat (usually). *Ligule an unfringed membrane*.

Inflorescence panicleate; contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 1.5–3 mm long; compressed laterally (somewhat); falling with the glumes. Rachilla terminated by a female-fertile floret. Glumes present; two; relatively



Fig. 171. *Polypogon monspeliensis*

large; more or less equal; long relative to the adjacent lemmas (exceeding the floret); awned (usually, apically), or awnless; similar (papery). *All florets female-fertile; proximal incomplete florets absent.*

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); 5 nerved; entire to incised (truncate, finely toothed via excurrent nerves); awnless, or awned (usually). *Awns 1*; median; from the sinus, or dorsal; non-geniculate; much shorter than the body of the lemma to about as long as the body of the lemma. Palea present; relatively long, or conspicuous but relatively short (*Chaetotropis*). Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; fusiform (*Chaetotropis*), or ellipsoid; hilum short; embryo large (rarely), or small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Poaceae; Poodae; Aveneae. 18 species. Mediterranean, southwest Asia. Helophytic to mesophytic; maritime-arenicolous, or halophytic, or glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. Indigenous species (2), naturalized species (2).

Intergeneric hybrids with *Agrostis* (*X Agropogon* P. Fourn.).

References. 1. Chippindall 1955. Gr. & Past. 2. Launert. 1970. FSWA. 3. Tutin. 1980. Fl. Europ.

Species treatment by G.E. Gibbs Russell.

- 1(0). Glumes with long, conspicuous awns that stand out from the panicle 2
Glumes awnless or rarely with short inconspicuous awns 3
2(1). Awns of glumes 10–25 mm long; awns of lemmas 5–10 mm long ***P. strictus***
Awns of glumes 4–8(–10) mm long; lemmas awnless or with a short inconspicuous awn to 2.5 mm long ***P. monspeliensis***
3(1). Plant 150–600 mm tall; panicle somewhat open, branches ascending; spikelets 1.5–2.0 mm long; lemmas awnless ***P. viridis***
Plant 30–200 mm tall; panicle narrowly cylindrical, branches appressed; spikelets 1.0–1.4 mm long; lemmas with a short fine awn from tip ***P. griquensis***

***Polypogon griquensis* (Stapf) Gibbs Russell ined.**

(=*Agrostis griquensis* Stapf);
(=*P. minutiflorus* Pilg.).

Annual; tufted; 30–200 mm tall. Leaf blades to 60 mm long; 1.0–1.5 mm wide. Spikelets 1.0–1.4 mm long. Panicle cylindrical, branches appressed; lemmas with a short fine awn from tip.

Flowering October. Wet places. Rare. Endemic. Transferred from *Agrostis* because the entire floret plus a short stipe together form the disseminule.

Description: Stapf Kew Bull. 1897 (290), Stapf 1898–1900 (546), Chippindall 1955 (98). Voucher: Acocks 2466. PRECIS code 9902440-00150.

***Polypogon monspeliensis* (L.) Desf.**

Annual; 60–500 mm tall. Leaf blades 50–200 mm long; 2–8 mm wide. Spikelets 2–3 mm long (excluding awns). Glume awns spreading, to 7 mm long; lemmas awnless or with a short awn to 2.5 mm.

Flowering September to April. Damp and disturbed places, often

in brackish soils. Common. Naturalized from Europe and Asia. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, Succulent Karoo, Desert, and Forest. Widely naturalized. Weed. One of the very few species recorded from all major biomes.

Description: Chippindall 1955 (102), Clayton et al. 1970–1982 (100). Illustration: Chippindall 1955 (fig. 74), Clayton et al. 1970–1982 (fig. 33). Voucher: Codd 636. PRECIS code 9902440-00400.



Fig. 171. Pl. 157.

Fig. 172. *Polypogon viridis*

Polypogon strictus Nees

Annual; tufted; 70–700 mm tall. Leaf blades to 200 mm long; 1–5 mm wide. Glumes with awns 10–25 mm long; lemmas with awns 5–10 mm long.

Flowering October to April. Wet places, usually in coastal areas. Locally common. Endemic.

Description: Chippindall 1955 (102). Voucher: Compton 2613. PRECIS code 9902440–00600.



Polypogon viridis (Gouan.) Breistr.

(= *Agrostis semiverticillata* (Forssk.) C. Christ.) 4; (= *P. semiverticillatus* (Forssk.) Hyl.) 4.

Annual; 150–600 mm tall. Leaf blades to 150 mm long; to 7 mm wide. Spikelets 1.5–2.0 mm long. Panicle open, branches ascending; lemmas awnless.

Flowering September to April. Wet places, especially riverbanks. Locally common. Naturalized from southern Europe. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Desert.

Description: Tutin 1980-(5:236). Voucher: Seydel 822. PRECIS code 9902440–00700.

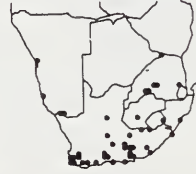


Fig. 172.

Prionanthium Desv.

Chondrolaena Nees, *Prionachne* Nees.

Annual; caespitose. Culms 40–430 mm high; herbaceous (slender); branched above, or unbranched above. Leaf blades linear (or filiform); flat, or rolled. *Ligule a fringe of hairs.*



Fig. 173. *Prionanthium pholiuroides*

Inflorescence a single spike, or a single raceme (spike-like); contracted (30–80 mm long, the axis curved beside each spikelet); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary, or in pairs, or in triplets; biseriate; not in distinct 'long-and-short' combinations; 3–6 mm long; compressed laterally; disarticulating above the glumes. Glumes two; more or less equal; about equalling the spikelets to much exceeding the spikelets; awnless; similar (navicular, rigid, leathery with with membranous margins enfolding the floret). All florets female-fertile only; or distal incomplete florets also present, merely underdeveloped, awnless; proximal incomplete florets absent.

Female-fertile florets 2. Lemmas less firm than the glumes; hairy, or hairless; without a germination flap; 3 nerved; entire; awnless. Palea present (sub-linear); relatively long; 2-nerved. Lodicules 2; fleshy. Stamens 3. Ovary glabrous.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Arundinoideae; Danthonieae. 2–3 species. South Africa. Helophytic (in seasonally wet places); in open habitats; glycophytic. Cape Province. 3 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Davidse. 1988. Bothalia 18: 143–153.

Species treatment by N.P. Barker.

- 1(0). Lemmas pubescent *P. dentatum*
Lemmas glabrous 2
- 2(1). Spikelets solitary; rachis triquetrous; glands on keel of glumes sessile or slightly stalked (rarely absent) *P. pholiuroides*
Spikelets paired (may be solitary near base and apex of inflorescence); rachis cylindrical; glands on keel of glumes conspicuously stalked *P. ecklonii*

Prionanthium dentatum (L.f.) Henr.

(= *Prionanthium rigidum* Desv.) 1.

Annual; tufted; 30–430 mm tall. Leaf blades 15–105 mm long; 0.5–3.0 mm wide. Spikelets 3.2–5.2 mm long; to 1.2 mm wide. Panicle spike-like, 5–75 mm long; rachis cylindrical; spikelets densely aggregated, laterally arranged, not obviously paired; glumes with prominent stalked glands on keel; lemmas pubescent; paleas pubescent between keels.

Flowering September. Nieuwoudtville area in Western Mountain Karoo. Rare. Biome: Succulent Karoo. Endemic. Collected again in 1975, over 200 years after it was last collected by Thunberg, by whom the taxon was first described.

Description: Davidse 1988 (151), Stapf 1898–1900 (455), Chippindall 1955 (271). Voucher: Davidse 33396. PRECIS code 9901800–00050.



Prionanthium ecklonii (Nees) Stapf

Annual; tufted; 190–370 mm tall. Leaf blades 40–160 mm long; 0.5–1.5 mm wide. Spikelets 4.4–6.1 mm long; to 1.5 mm wide. Panicle spike-like, inconspicuously secund, 15–95 mm long; rachis cylindrical; spikelets arranged alternately in pairs, but usually solitary near base and apex; glumes with prominent, conspicuously stalked glands on the keel; lemmas glabrous; paleas glabrous.



Flowering September to October. Low altitudes in Coastal Renosterveld. Rare. Biome: Fynbos. Endemic.

Description: Davidse 1988 (151), Stapf 1898–1900 (455), Chippindall 1955 (271). Illustration: Davidse 1988 (fig. 2). Voucher: Ecklon & Zeyher s.n. PRECIS code 9901800–00100.

Prionanthium pholiuroides Stapf

Fig. 173. Pl. 158.

Annual; tufted; 40–250 mm tall. Leaf blades 15–70 mm long; 0.5–1.5 mm wide. Spikelets 3.1–7.0 mm long; to 1.5 mm wide. Inflorescence a second, 2-ranked spike, 15–60 mm long; rachis triquetrous; spikelets arranged alternately, single (rarely in pairs); keels of glumes with sessile glands; lemmas glabrous; paleas glabrous.

Flowering October to December. Seasonally wet, shallow depressions. Rare. Biome: Fynbos. Endemic.

Description: Davidse 1988 (151), Stapf 1898–1900 (456), Chippindall 1955 (271). Illustration: Chippindall 1955 (fig. 243). Voucher: Anderson 8. PRECIS code 9901800–00200.

Prosphytochloa Schweick.

Perennial; long-rhizomatous (rhizomes horizontal, with cataphylls). Culms 10000 mm high (or more); herbaceous; *scandent* (by retrorse hairs on the leaf blade margins); branched above. Leaf blades linear-lanceolate to lanceolate; flat. *Ligule an unfringed membrane*.

Inflorescence paniculate (terminating main culm and laterals); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 6–9 mm long; compressed laterally (slightly); disarticulating above the glumes (i.e. above the rudimentary glumes). Glumes present, or absent; two (these reduced to a bilobed to entire hyaline cup); minute; more or less equal; awnless. *Proximal incomplete florets* 2; epaleate; sterile (subulate, edged with minute hyaline spines, variable in size).

Female-fertile florets 1. Lemmas entire; awnless; 5 nerved. Palea present (similar to the lemma, which clasps it); relatively long; with several nerves (3). Lodicules 2; membranous (above, but fleshy below); glabrous. Stamens 6. Ovary glabrous. Fruit medium sized (5 to 6 mm long, brown); fusiform; hilum long-linear; embryo small.

Transverse section of leaf blade. Mesophyll with arm cells; with fusoids (i.e. with lateral sheath extensions), or without fusoids (if these not so interpreted). Midrib vascularization complex (there being a small bundle adaxial to the main one).

Cytology, classification, distribution. Chromosome base number, $x = 12$. Bambusoideae; Oryzodae; Oryzae. 1 species. South Africa. Helophytic; in shade; glycophytic. Transvaal, Swaziland, Natal, and Cape Province. 1 indigenous species.

References. 1. Schweickerdt. 1961. *Der Zuchter* 31: 194.

Species treatment by G.E. Gibbs Russell.

Prosphytochloa prehensilis (Nees) Schweick.

Fig. 174. Pl. 159.

(= *Potamophila prehensilis* (Nees) Benth.) 1.

Perennial; climber; to 10000 mm tall. Leaf blades to 150 mm long; 5–10 mm wide (scabrid). Spikelets 6–9 mm long. Inflorescence a loose panicle; spikelets with solitary female-

fertile florets subtended by minute cuplike glumes and two subulate sterile lemmas.

Flowering November to April. Moist forests, where it climbs in dense masses. Infrequent. Biome: Forest. Endemic.

Description: Chippindall 1955 (33). Illustration: Chippindall 1955 (fig. 3). Voucher: Codd 8411. PRECIS code 9901561–00100.

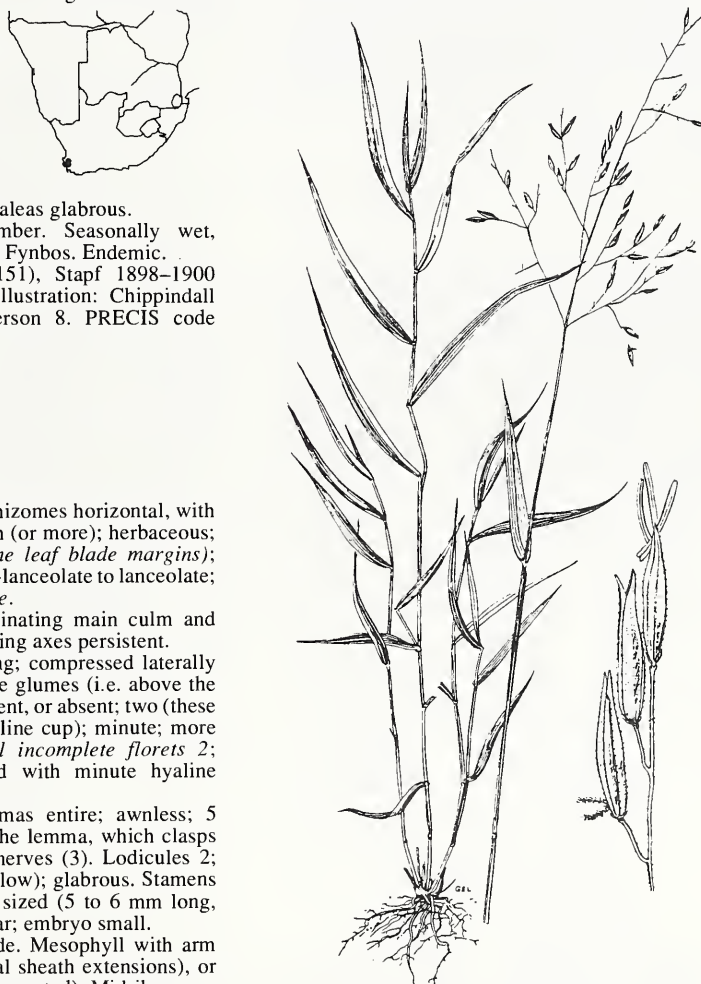


Fig. 174. *Prosphytochloa prehensilis*

Pseudechinolaena Stapf

Loxostachys Peter.

Annual; decumbent. Culms 100–600 mm high; herbaceous; branched above. Leaf blades lanceolate (acuminate); flat; *pseudopetiolate*; with *readily visible transverse veins*. *Ligule a fringed membrane*. The spikelets of sexually distinct forms on the same plant (some variously incomplete), or all alike in sexuality.

Inflorescence of spike-like main branches (*spiciform racemes*); espatheate. Spikelet-bearing axes persistent.

Spikelets in pairs, or solitary (via suppression of one of the pair); consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations. *Female-fertile spikelets* 4.6 mm long; *adaxial*; compressed laterally; falling with the glumes. Glumes two; more or less equal (or G1 shorter); awnless; very dissimilar (first smooth, upper gibbous with translucent intercostal glands, and these often

with hooked spines). *Proximal incomplete florets* 1; paleate, palea fully developed; male, or sterile.

Female-fertile florets 1. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (papery); smooth; not becoming indurated; hairless (sometimes with hooks); having the margins tucked in onto the palea; with a clear germination flap; 3-5 nerved; entire; awnless. Palea present. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (1.5 mm), ellipsoid; hilum short; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Panicoideae; Panicodae; Paniceae. 6 species. 5 in Madagascar, 1 pantropical. Mesophytic; in shade (forest); glycophytic. Transvaal, Natal and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Pseudechinolaena polystachya (Kunth) Stapf

Soft slender perennial, or annual (often mat-forming); to 400 mm tall. Leaf blades 10–80 mm long; to 14 mm wide. Spikelets 3.5–5.0 mm long (reduced spikelets often present). Culms prostrate; spikelets burr-like; upper glume usually with stiff hooked hairs.

Fig. 175. Pl. 160.



Fig. 175. *Pseudechinolaena polystachya*

Flowering August to September and December to April. In forest shade. Locally common. Biome: Forest. Throughout tropics. Similar in habit to other forest grasses in *Panicum* and *Oplismenus*, which all lack the hooklike hairs on the upper glumes that aid in dispersing the mature spikelets of this genus.

Description: Chippindall 1955 (365), Clayton et al. 1970–1982 (545). Illustration: Chippindall 1955 (fig. 314). Voucher: Schweickerdt 1442. PRECIS code 9901010–00100.

Pseudopentameris Conert

Sometimes included in *Danthonia* sensu lato.

Perennial; caespitose. Culms 300–1200 mm high; herbaceous; branched above, or unbranched above. *Leaves auriculate (from the base of the blade)*. Leaf blades linear; flat, or rolled. *Ligule a fringe of hairs*.

Inflorescence paniculate (40–250 mm long); contracted (but central axis visible); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 35–55 mm long; compressed laterally; disarticulating above the glumes. Glumes present; two; relatively large (35–55 mm long); more or less equal; about equalling the spikelets to much exceeding the spikelets; awnless; similar (lanceolate, membranous). Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2, or 3. Lemmas decidedly firmer than the glumes (leathery); hairy (villous); without a germination flap; 9 nerved; incised; awned. Awns 3; median and lateral. The median awn different in form from the laterals; from the sinus; geniculate; much longer than the body of the lemma. Palea present (glabrous, by contrast with *Pentameris*); relatively long (exceeding the lemma lobes); 2-nerved. Lodicules fleshy; ciliate (or at least ciliolate), or glabrous. Stamens 3. Ovary glabrous. Fruit medium sized (about 6 mm long); hilum long-linear (more than half the grain length); pericarp fused.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Arundinoideae; Danthonieae. 2 species. South Africa. Mesophytic; in open habitats (mountain Fynbos); glycophytic. Cape Province. 2 indigenous species.

References. 1. Conert. 1971. Mitt. Bot. Stsamml. Munch, 10: 304. 2. Ellis. 1985. Bothalia 15: 561.

Species treatment by N.P. Barker.

- 1(0). Lemmas pubescent over entire surface **P. brachyphylla**
 Lemmas basally glabrous, pubescent apically,
 including the lemma lobes **P. macrantha**

Pseudopentameris brachyphylla (Stapf) Conert

(=*Danthonia brachyphylla*
Stapf) 1.

Fig. 176.



Perennial; tufted; 300–900 mm tall. Leaf blades to 150 mm long; to 4 mm wide. Spikelets 27–37 mm long (excluding awns); 10 mm wide (excluding awns). Leaves clustered basally, obviously distichous, open and flat or folded; dead leaves tightly curled; lemma body 5.5–6.5 mm long, lemma lobes 10–19 mm long, including bristles into which the lobes attenuate; lemma backs completely pubescent; central awn geniculate, 19–30 mm long.

Flowering August to December. Rocky, gravelly or



Fig. 176. *Pseudopentameris brachyphylla*

sandy lower slopes of Cape fold mountains. Locally common (hills behind Hermanus and Betty's Bay). Biome: Fynbos. Endemic. Studied anatomically by Ellis (1985), and found to be very similar to *P. macrantha*.

Description: Stapf 1898–1900 (520), Chippindall 1955 (250). Illustration: Chippindall 1955 (fig. 221). Voucher: Zeyher 1825b. PRECIS code 9902081–00100.

***Pseudopentameris macrantha* (Schrad.) Conert**

(= *Danthonia macrantha*
Schrad.) 1.

Perennial; tufted; 800–1200 mm tall. Leaf blades to 500 mm long; to 4 mm wide. Spikelets 30–45(–60) mm long (excluding awns); 15 mm wide. Leaves basally clustered, open or involute in cross section; dead leaves falcate but not tightly



Pl. 161.

curled; lemma body 5.5–10.0 mm long, lemma lobes 10–23 mm long, including bristles into which the lobes attenuate; lemma backs glabrous in lower half, pubescent in upper half including lemma lobes; central awn geniculate, 15–50 mm long.

Flowering August to December. Rocky, stony or sandy slopes in both TMS and limestone geologies. Locally common (on the lower slopes of Table Mountain). Biome: Fynbos. Endemic. Ellis (1985) considers this species to be anatomically almost identical to *P. brachyphylla*.

Description: Stapf 1898–1900 (519), Chippindall 1955 (251). Illustration: Conert 1971 plate 1. Voucher: Sandwith 73. PRECIS code 9902081–00200.

***Puccinellia* Parl.**

Atropis (Trin.) Griseb.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 40–1000 mm high; herbaceous. Sheath margins free (but rarely closed to almost one third their length). Leaf blades linear; flat, or folded, or rolled. *Ligule an unfringed membrane*.

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets not secund; 2–13 mm long; *compressed laterally*; disarticulating above the glumes. *Rachilla prolonged beyond the uppermost female-fertile floret*. Glumes two; very unequal; markedly shorter than the spikelets; *decidedly shorter than the adjacent lemmas*; awnless; *non-carinate*; similar. Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.

Female-fertile florets 2–10. Lemmas similar in texture to the glumes; 5 nerved; entire (or erose, often ciliate); awnless. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; *hilum short*; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Poeae. About 80 species. North temperate. Helophytic, or mesophytic; usually halophytic. Namibia, Orange Free State, and Cape Province. Indigenous species (3), naturalized species (1).

Intergeneric hybrids with *Phippsia* — *X Pucciphippsia* Tselev.

References. 1. Chippindall. 1955. Gr. & Past. 2. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.

- 1(0). Panicle linear, 5–15 mm in diameter, branches very slender, appressed or very slightly spreading; spikelets usually their own length apart but not overlapping for more than half their length 2
- Panicle ellipsoid or pyramidal, more than 15 mm in diameter, branches slender or stout, at least the lower ones spreading, horizontal or reflexed; spikelets dense, overlapping for more than half their length 3
- 2(1). Culms 1-noded; lowest leaf sheaths shiny, longer than 50 mm, overlapping, enclosing the culms and lower part of the panicle; lemmas 2.2–2.8 mm long *P. angusta*
- Culms 2-noded; lowest leaf sheaths dull, shorter than 50 mm, usually not overlapping, culms and panicle usually not enclosed; lemmas 2.0–2.2 mm long *P. acroxantha*
- 3(1). Panicle pyramidal or elongate; branches slender, often deflexed, naked in the lower half *P. distans*
- Panicle ellipsoid, rather compact; branches stout, stiff, not more than 90 degrees from the main axis, bearing spikelets nearly to the base *P. fasciculata*

Fig. 177. *Puccinellia fasciculata****Puccinellia acroxantha* Smith & C.E. Hubb.**

Perennial; loosely tufted; 100–600 mm tall. Leaf blades 50–200 mm long; 1–2 mm wide. Spikelets 3–5 mm long; to 1.5 mm wide. Culms 2-noded; lowest leaf sheath dull, shorter than 50 mm, usually not overlapping and enclosing culm and lower part of panicle; panicle linear, branches very slender, contracted; lemmas 2.0–2.5 mm long.

Flowering January. On Karoo-turf soil of varying salinity, in depressions periodically flushed with fresh



Pl. 162.

water. Rare. Biome: Grassland. Endemic. The status of this species is very uncertain, it might well be a local form of *P. distans*. Further research is needed.

Description: Smith & Hubbard 1929 Kew Bull. (86), Linder (39), Chippindall 1955 (50). Voucher: Smith 5415. PRECIS code 9904150–00100.

***Puccinellia angusta* (Nees) Smith & C.E. Hubb.**

Perennial; densely tufted; 300–600 mm tall. Leaf blades 75–100(–300) mm long; 1.0–1.5 (–2.5) mm wide. Spikelets 4.0–5.5 mm long; 1.0–1.5 mm wide. Culms 1-noded; lowest leaf sheaths shining, longer than 50 mm, overlapping and enclosing the culms and lower part of the panicle; panicle linear, branches appressed, slender; lemmas 2.2–2.8 mm long.

Flowering August to October. In disturbed areas on strongly saline moist soils. Infrequent to locally common. Biome: Fynbos, Grassland and Desert. Endemic. Said to be a good winter pasture. The voucher and type specimen was collected in abnormally high saline soil where few other plants survived. One wonders if the vegetative differences that distinguish it from *P. acroxantha* were induced by the abnormal habitat.

Description: Smith & Hubbard 1929 Kew Bull. (85), Linder (38), Chippindall 1955 (50). Voucher: Smith 4385. PRECIS code 9904150–00200.

***Puccinellia distans* (L.) Parl.**

Perennial; tufted; 250–650 mm tall. Leaf blades 70–180 mm long; 2–4 mm wide. Spikelets 4–8 mm long; 1–2 mm wide. Panicle pyramidal or elongate, branches (at least some) naked in the lower half, spreading, often horizontal or deflexed; lemmas 1.5–4.0 mm long.

Flowering April, June, July, and October. In wet often very saline habitats along rivers, irrigation canals and furrows. Infrequent. Naturalized from Europe. Biome: Fynbos, Nama-Karoo, and Succulent Karoo. Cosmopolitan in temperate regions. Weed. Distinguished by its pyramidal panicle with spikelets only in the upper half of the branches.

Description: Hughes & Halliday 1980 Fl. Europ. (5:168), Linder (37), Hitchcock & Chase 1950 (81). Voucher: Smook 3383. PRECIS code 9904150–00250.

***Puccinellia fasciculata* (Torr.) Bickn.**

Perennial; tufted; 200–400 mm tall. Leaf blades 80–200 mm long; 2–5 mm wide. Spikelets 4–7 mm long; 1–2 mm wide. Panicle ellipsoid, rather compact, branches stout, bearing spikelets nearly to the base; lemmas 1.5–2.5 mm long.

Flowering September to January. In wet, saline habitats like salt marshes, often in disturbed areas. Infrequent. Naturalized from Europe. Biome: Fynbos, Nama-Karoo, and Succulent Karoo. Europe. Distinguished by its compact panicle and stiff branches.

Description: Hughes & Halliday 1980 Fl. Europ. (5:168), Linder (36), Hitchcock & Chase 1950 (80), Chippindall 1955 (50). Illustration: Chippindall 1955 (fig. 19), Hitchcock & Chase 1950 (fig. 112). Voucher: Adamson 2989. PRECIS code 9904150–00300.



Fig. 177.

Rendlia Chiov.

Sometimes included in *Microchloa* R. Br.

Perennial; densely caespitose (from a cushion of old, fibrous leaf sheaths). Culms 50–350 mm high; herbaceous; unbranched above. Leaf blades linear; to 0.7 mm wide; folded (at the base, the adaxial surfaces adnate). *Ligule a fringed membrane (the 'membrane' unusually firm)*. The spikelets of sexually distinct forms on the same plant (the uppermost 2–3 spikelets reduced), or all alike in sexuality.

Inflorescence a single spike (to 50 mm long — rarely a pair of spikes); espatheate. Spikelet-bearing axes persistent.

Female-fertile spikelets solitary; alternately biseriate; 4–5.5 mm long; with the G1 compressed obliquely, the G2 compressed dorsiventrally; disarticulating above the persistent G1, the G2 falling with and enveloping the florets; *not disarticulating between the florets. Rachilla prolonged beyond the uppermost female-fertile floret*. Glumes two; more or less equal; much exceeding the spikelets; awnless; very dissimilar (firmly membranous, the G1 laterally compressed, the G2 dorsally compressed). Incomplete florets distal to the female-fertile florets, one per spikelet, male or sterile, banana-shaped, hairless, the lemma shorter and thinner than the L1, the palea reduced or absent; awnless. *Proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas similar in texture to the glumes; without a germination flap; 3 nerved; incised; awnless. Palea present; relatively long (slightly exceeding the lemma). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous (suppressed in the upper floret). Fruit small (2 mm); ellipsoid; hilum short; embryo small (seemingly, judged from immature material).

Photosynthetic pathway and related features. C₄; XyMS+. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 1 species. Eastern tropical and southern Africa. Mesophytic; in open habitats (shallow soils in grasslands); glycophytic. Transvaal, Orange Free State, Natal, and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Rendlia altera (Rendle) Chiov.

(=*R. nelsonii* (Stapf)
Chiov.) 1.

Mahem's crest, kleinrolblaar.

Perennial; tufted (cushion-like); 200–400 mm tall. Leaf blades 30–250 mm long; less than 1.5 mm wide. Spikelets 4.0–5.5 mm long. Leaf bases persistent and becoming fibrous with age; spike a solitary 'toothbrush', 20–50 mm long; glumes twice as long as the florets.

Flowering September to May. Shallow humiferous or well-drained sandy soils. Locally common. Biome: Grassland. Tropical Africa. Clayton & Renvoize (1986) put this genus in synonymy with *Microchloa*. As recognized here, *Rendlia* has a larger inflorescence and spikelets with two florets.

Description: Chippindall 1955 (193), Clayton et al. 1970–1982 (331). Illustration: Chippindall 1955 (fig. 169), Clayton et al. 1970–1982 (fig. 93). Voucher: Du Toit 2502. PRECIS code 9902941–00100.

Fig. 178. Pl. 163.



Fig. 178. *Rendlia altera*

Rhytachne Desv.

Lepturopsis Steud.

Annual, or perennial; caespitose. Culms 250–1200 mm high; herbaceous; *unbranched above (few noded)*. Leaf blades linear; flat, or folded, or rolled, or acicular. *Ligule an unfringed membrane (short)*. Plants bisexual, with bisexual spikelets. *The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (the pedicellate spikelets variously reduced)*.

Inflorescence a single raceme (of single 'racemes' terminating the culms, these cylindrical and culm-like until the embedded spikelets open); spatheate, or espatheate; not comprising 'partial inflorescences' and foliar organs.

Spikelet-bearing axes spike-like; solitary; with substantial rachides; disarticulating at the joints. 'Articles' with a basal callus-knob.

Spikelets solitary (accompanied by a scale-tipped pedicel, when the pedicellate spikelet is suppressed), or in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only, or sterile (variously reduced, sometimes suppressed).



Fig. 179. *Rhytachne robusta*

Female-fertile spikelets 2–8 mm long; compressed dorsiventrally; falling with the glumes. Glumes two; more or less equal; awned (G1 and/or G2, sometimes), or awnless; very dissimilar (G1 leathery, convex, often transversely rugulose, G2 membranous or hyaline, with or without a terminal subule). *Proximal incomplete florets* 1; paleate, palea reduced; male, or sterile (rarely).

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire; awnless. Palea present; relatively long, or conspicuous but relatively short, or very reduced. Lodicules 2; fleshy. Stamens 3. Ovary glabrous.

Cytology, classification, distribution. Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. 12 species. Tropical and southern Africa, Madagascar, tropical South America. Helophytic (pans and riversides), or mesophytic (grasslands); in open habitats; glycophytic. Namibia, Natal, and Cape Province. 3 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Leaf blades setaceous; sessile spikelets 3–5 mm long, lower glume strongly transversely rugose

. *R. rottboellioides*

- Leaf blades expanded; sessile spikelets over 5 mm long, lower glume not transversely rugose 2

- 2(1). Leaf blades 2–4 mm wide; lower glume smooth below; pedicel and rachis with a few hairs; pedicel not broad and flattened, smooth, with a green line beside each edge; pedicellate spikelets 3 mm long; Namibia *R. robusta*

Leaf blades 6–10 mm wide; lower glume with strong longitudinal nerves; pedicel and rachis lacking hairs; pedicel broad and flattened, with many faint nerves, entirely green; pedicellate spikelets reduced to a scale less than 1 mm long; Natal . *R. latifolia*

Rhytachne latifolia Clayton

Perennial; tufted; 400–1000 mm tall. Leaf blades 150–500 mm long; 6–10 mm wide. Spikelets (sessile) 5.5–8 mm long (pedicellate reduced to a scale less than 1 mm long). Rachis and pedicels glabrous, pedicels broad and flattened, with many faint nerves, entirely green; lower glume with strong longitudinal nerves.

Flowering January to March. Shaded streamsides and woodland pans. Rare. North to Tanzania. Not well separated from *R. robusta*, and possibly conspecific with it.

Description: Clayton et al. 1970–1982 (845). Voucher: Tinley 895. PRECIS code 9900340–00050.



Rhytachne robusta Stapf

Perennial; tufted; about 1200 mm tall. Leaf blades to 400 mm long; 2–4 mm wide. Spikelets (sessile) 5–6 mm long (pedicellate reduced in size, to 3 mm long). Rachis and pedicels with sparse hairs, pedicels not broad and flattened, with a green line beside each edge; lower glume of sessile spikelets smooth below, with nerves on upper end only.

Flowering January. Grassveld. Rare, but possibly locally common. Biome: Savanna. Southern tropical Africa.

Description: Stapf 1917 (82). Voucher: Killick & Leistner 3287. PRECIS code 9900340–00100.



Fig. 179.

Rhytachne rottoellioides Desv.

Pl. 164.

Slender perennial; densely tufted; 250–1000 mm tall. Leaf blades to 300 mm long; setaceous. Spikelets (sessile) 3–5 mm long (pedicellate reduced to an arista). Plant reddish or purplish brown; lower glume strongly transversely rugose.

Flowering November to February. Vleis and swampy ground. Rare. Tropical Africa, Madagascar and Brazil. The plant resembles *Schizachyrium sanguineum*, which grows in the open veld.

Description: Chippindall 1955 (519), Clayton et al. 1970–1982 (843). Illustration: Chippindall 1955 (fig. 415), Clayton et al. 1970–1982 (fig. 198). Voucher: Huntley 779. PRECIS code 9900340–00200.

Rottboellia L.f.*Stegosia* Lour.

Annual; caespitose. Culms 300–3000 mm high; herbaceous; branched above. Leaf blades broad; flat. Ligule an unfringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic.

Inflorescence a single raceme, or panicle (with terete, spike-like 'racemes', terminating the culms and branches, or axillary, solitary or in fascicles); spatheate; a complex of 'partial inflorescences' and intervening foliar organs. Spikelet-bearing axes spike-like (cylindrical, with embedded spikelets); solitary and clustered (fascicled); with substantial rachides; disarticulating at the joints. 'Articles' with a basal callus-knob.

Spikelets in pairs; consistently in 'long-and-short' combinations; these 'pedicellate'/sessile. Pedicels of the 'pedicellate' spikelets discernible, but fused with the rachis. The sessile spikelets hermaphrodite. The 'pedicellate' spikelets male-only, or sterile, striate, compressed, herbaceous. Female-fertile spikelets compressed dorsiventrally (trigonous); falling with the glumes (and with the joint, the pedicellate spikelets falling separately). Glumes two; more or less equal; awnless; very dissimilar (lower flat-backed, 2-keeled above, upper naviculate, winged). Proximal incomplete florets 1; paleate, palea fully developed; male.

Female-fertile florets 1. Lemmas less firm than the glumes; entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 9$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. 4 species. Tropical and subtropical Africa, Asia. Helophytic to mesophytic; in shade, or in open habitats (woodland, swamps, often in disturbed ground or a weed of cultivated ground); glycophytic. Namibia, Botswana, Transvaal, Swaziland, and Natal. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Rottboellia cochinchinensis (Lour.) Clayton

Fig. 180. Pl. 165.

(=*R. exaltata* L.f.) 2.

Guineafowl grass, kokoma grass, tarentaalgras.

Annual (often robust); 300–3000 mm tall. Leaf blades to 600 mm long; 10–30 mm wide. Spikelets (sessile and pedicellate)

4–7 mm long. Racemes cylindrical, spikelets sunken; basal sheaths with stiff irritating hairs.

Flowering December to June. Wet places, often on black turf soil, and in disturbed places. Infrequent. Biome: Savanna. Throughout Old World tropics, introduced to America. Weed (ruderal).

Description: Chippindall 1955 (520), Clayton et al. 1970–1982 (853). Illustration: Chippindall 1955 (fig. 416), Clayton et al. 1970–1982 (fig. 203). Voucher: Ward 2118. PRECIS code 9900310–00050.

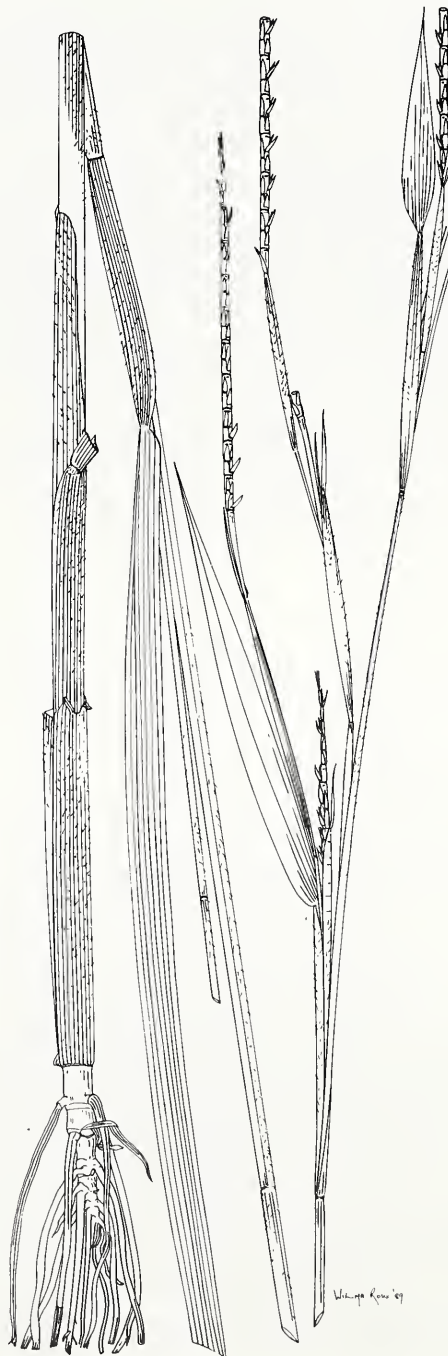


Fig. 180. *Rottboellia cochinchinensis*



Sacciolepis Nash*Rhampholepis* Stapf.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 100–2000 mm high; herbaceous; branched above. Leaf blades linear to linear-lanceolate; flat, or rolled (convolute). *Ligule an unfringed membrane to a fringed membrane. Plants bisexual, with bisexual spikelets.*

Inflorescence paniculate; open (rarely), or contracted (usually spicate); espatheate. Spikelet-bearing axes persistent.

Spikelets 0.8–5.2 mm long; compressed laterally to not noticeably compressed (gibbous, often oblique); falling with the glumes. Glumes two; very unequal; awnless; very dissimilar, or similar (both membranous or hyaline, but upper often inflated and gibbous). Upper glume distinctly saccate. Proximal incomplete florets 1; paleate, or epaleate, palea when present fully developed to reduced; male (rarely), or sterile.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (papery to subcrustaceous); smooth; becoming indurated, or not becoming indurated; hairless (glossy); having the margins tucked in onto the palea; with a clear germination flap; 3 nerved, or 5 nerved (obscurely so); entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicoideae; Paniceae. 30 species. Tropical and subtropical. Hydrophytic to helophytic; in open habitats (in or near water or in wet places); glycophytic. Namibia, Botswana, Transvaal, Swaziland, Natal and Cape Province. 8 indigenous species

References. 1. Simon. 1972. Kew Bull. 27: 387. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Inflorescence a loosely contracted panicle; spikelets distinctly pedicelled; upper glume more than 5 times the length of the lower glume . . . ***S. curvata***
 Inflorescence a false spike; spikelets subsessile; upper glume less than 3 times the length of the lower glume 2
- 2(1). Spikelets up to 2.7 mm long 3
 Spikelets more than 2.7 mm long 5
- 3(2). Plants annual; spikelets 1.3–1.9 mm long
 ***S. huillensis***
 Plants perennial; spikelets 1.5–2.2 mm long 4
- 4(3). Leaf blades subterete to convolute; spikelets more or less loosely arranged on the central axis, pubescent; lower leaf sheaths rarely with cross-veins; plants up to 900 mm tall ***S. chevalieri***
 Leaf blades flattened or folded; spikelets more or less tightly arranged on the central axis, glabrous or rarely pubescent; lower leaf sheaths with cross-veins; plants up to 1500 mm tall ***S. typhura***
- 5(2). Leaf sheaths with prominent auricles 1.5–2.5 mm long; spikelets laterally compressed; plants perennial or slender annuals; culms not spongy, less than 5 mm in diameter 6
 Leaf sheaths without auricles or auricles minute when present; spikelets slightly dorsally compressed; plants perennial, robust, aquatic; culms spongy at the base, 5–18 mm in diameter 7
- 6(5). Plants annual, prostrate, with prominent aerial roots from the lower nodes; culms 8–10-noded; spikelets 2.7–3.1 mm long, with the lower glume 1.0–1.5 mm long and the lower palea 1.2–1.8 mm long
 ***S. indica***
 Plants perennial, erect, with a short oblique rhizome; culms 4–6-noded; spikelets 3.0–4.4 mm long, with

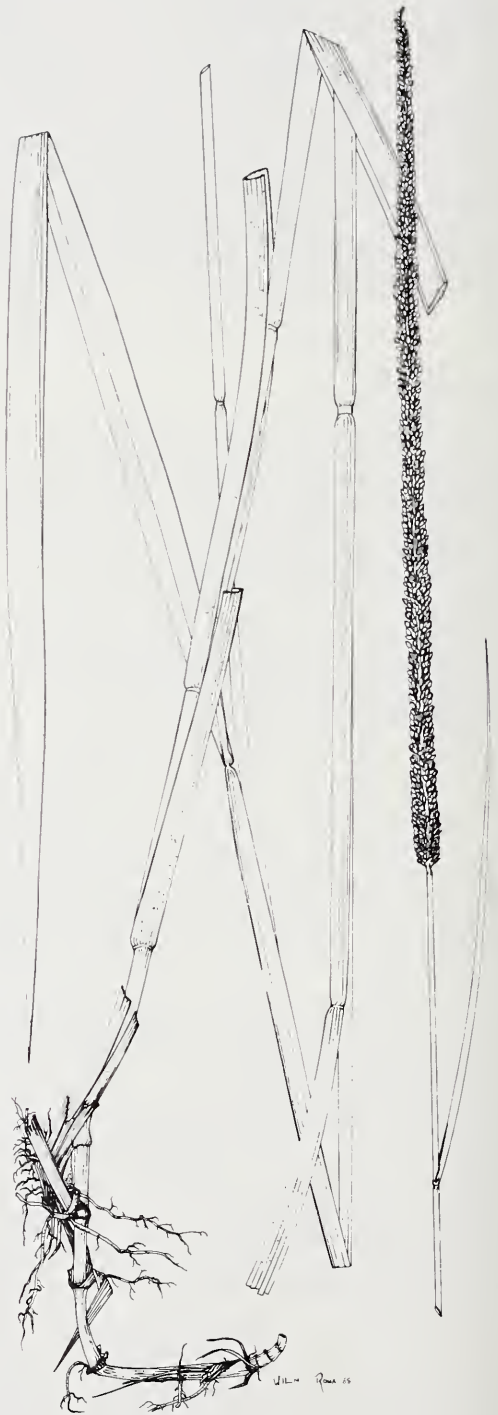


Fig. 181. *Sacciolepis typhura*

the lower glume 1.8–2.9 mm long and the lower palea 1.8–2.8 mm long *S. rigens*
 7(5). Spikelets 2.7–4.1 mm long, obtuse to subacute, light green to brown; lower palea 1.5–1.8 mm long; upper floret 2.2–3.2 mm long *S. africana*
 Spikelets 3.9–4.5 mm long, acute to acuminate, light green to yellowish; lower palea 2.0–2.2 mm long; upper floret 3.2–3.5 mm long *S. interrupta*

***Sacciolepis africana* C.E. Hubb. & Snowden**

Perennial; rhizomatous (culms thick, spongy, often decumbent and rooting at the nodes); 300–1800 mm tall. Leaf blades 50–400 mm long; 3–15 mm wide. Spikelets 2.5–4.1 mm long. Leaf sheaths with cross-veins; panicle dense, spike-like, 40–300 mm long; spikelets obtuse to subacute, dorsally compressed; lower glume 1/4–1/3 the spikelet length; upper floret 2.2–3.2 mm long.

Flowering February to May. Standing in water in swampy or seasonally flooded areas and along river banks. Infrequent. Biome: Savanna. Throughout tropical Africa. Closely related to *S. interrupta*, which has larger spikelets with acute or acuminate tips.

Description: Chippindall 1955 (351), Clayton et al. 1970–1982 (455). Illustration: Clayton et al. 1970–1982 (fig. 120). Voucher: De Winter & Marais 4528. PRECIS code 9901240–00100.



***Sacciolepis chevalieri* Stapf**

Perennial; shortly rhizomatous and tufted; 200–900 mm tall. Leaf blades 50–200 mm long; usually rolled or folded, 1–3 mm wide. Spikelets 1.5–2.2 mm long. Leaf sheaths with cross-veins absent or inconspicuous; panicle spike-like, scanty, sometimes interrupted, 20–160 mm long; spikelets laterally compressed; lower glume 2/3 and upper glume 4/5 the spikelet length.

Flowering October to March. In wet soils, usually black turf, in swamps, vleis or along streams. Infrequent. Biome: Savanna and Grassland. Throughout tropical Africa and in Madagascar. Intergrades into *S. typhura*, which is a larger plant with thicker, usually spongy culms, prominent cross-veins on the leaf sheaths and denser, longer panicles.

Description: Stapf 1920 (754), Clayton et al. 1970–1982 (459). Voucher: Reid 426. PRECIS code 9901240–00300.



***Sacciolepis curvata* (L.) Chase**

Forest hood grass, kappiegras.

Short-lived perennial, or annual; tufted (prostrate at the base, trailing, rooting at the lower nodes); 200–900 mm tall. Leaf blades 20–100 mm long; 3–7 mm wide. Spikelets 2.5–3.5 mm long. Leaf blades mostly cauline, narrowly lanceolate, soft and thin; panicle loosely contracted; spikelets distinctly pedicellate and conspicuously asymmetrical; upper glume more than five times longer than lower glume.

Flowering mainly October to April. In damp shady places along rivers or streams and in forest undergrowth. Occasionally in woodlands and mopaneveld. Infrequent to locally common. Biome: Savanna. Tropical east Africa to



India. Natural pasture (but too slender to be productive). Other *Sacciolepis* species in our area all have spike-like panicles.

Description: Stapf 1920 (766), Chippindall & Crook 1976 (239), Chippindall 1955 (357), Clayton et al. 1970–1982 (455). Illustration: Chippindall 1955 (fig. 307). Voucher: Smook 5717. PRECIS code 9901240–00400.

***Sacciolepis huillensis* (Rendle) Stapf**

Annual swamp grass.

Short-lived perennial, or annual; loosely tufted and hydrophyte; 100–250–(500) mm tall. Leaf blades 15–120 mm long; 1–5 mm wide. Spikelets 1.3–1.8 mm long. Inflorescence spike-like; spikelets shortly pedicellate, laterally compressed; lower glume 1/3–2/3 the spikelet length; upper glume more or less equalling the spikelet.

Flowering March to June. At high altitudes in sandy soils at water edges, sometimes partly submerged in water. Rare. Biome: Savanna. Southern tropical Africa. Distinguished from *S. chevalieri* and *S. typhura* by its annual habit and smaller spikelets.

Description: Stapf 1920 (755), Chippindall & Crook 1976 (238), Chippindall 1955 (358), Clayton et al. 1970–1982 (458). Voucher: Johnstone 356. PRECIS code 9901240–00700.



***Sacciolepis indica* (L.) A. Chase**

(= *S. auriculata* Stapf) 2.

Annual; tufted (with few basal leaves; culms slender, decumbent or ascending, often with aerial roots); 100–1000 mm tall. Leaf blades 20–200 mm long; 1–7 mm wide. Spikelets 2.7–3.1 mm long. Culms solid, 1.0–2.5 mm in diameter; leaf sheaths with auricles 1.5–2.5 mm long; panicle 10–130 mm long; spikelets laterally compressed; lower glume 1.0–1.5 mm long, 1/2 the spikelet length; upper glume equalling the spikelet.

Flowering November to April. In sandy soils at stream-sides and in marshy places. Rare. Biome: Savanna. Old world tropics. Closely related to *S. rigens*, which is a perennial from northern Namibia with a short oblique rhizome and larger spikelets.

Description: Hitchcock & Chase 1950 (688), Clayton et al. 1970–1982 (458). Voucher: Schackleton 472. PRECIS code 9901240–00720.



***Sacciolepis interrupta* (Willd.) Stapf**

Perennial; hydrophyte and rhizomatous (culms thick, spongy and rooting at lower nodes); 300–1500 mm tall. Leaf blades 50–300 mm long; 3–17 mm wide. Spikelets 3.5–4.5 mm long. Panicle spike-like, 50–300 mm long, not very dense; spikelets dorsally compressed, acute to acuminate; upper floret 3.2–3.5 mm long.

Flowering July and March. In shallow water and swampy areas. Rare. Naturalized from India or Asia. Biome: Savanna. India to southeast Asia. Introduced into tropical Africa. Closely related to *S. africana*, which has smaller spikelets with obtuse to subacute tips.

Description: Stapf 1920 (757), Clayton et al. 1970–1982 (456). Voucher: Cresswell 19. PRECIS code 9901240–00730.



Sacciolepis rigens (Mez) A. Chev.

Perennial; loosely tufted and rhizomatous (rhizome short and oblique); 600–2000 mm tall. Leaf blades 100–400 mm long; 2–6 mm wide. Spikelets 3.0–4.5 mm long. Culms solid, 1.0–2.5 mm in diameter; leaf sheaths with auricles 1.5–2.5 mm long; panicle 60–200 mm long; spikelets laterally compressed; lower glume 1.8–2.9 mm long, 1/2 the spikelet length; upper glume equalling the spikelet.

Flowering around January. Sandy moist soil along rivers or streams. Rare. Biome: Savanna. Unevenly but widely distributed throughout tropical Africa. Closely related to *S. indica*, which is annual with smaller spikelets and known in southern Africa only from Transkei.

Description: Clayton et al. 1970–1982 (460). Voucher: De Winter & Wiss 4310. PRECIS code 9901240–00750.

**Sacciolepis typhura** (Stapf) Stapf

(=*S. cinereo-vestita* (Pilg.) C.E. Hubb.) 2; (=*S. glaucescens* Stapf) 2.

Purple hood grass.

Robust, erect perennial; hydrophyte and rhizomatous (rhizome creeping and branched, culms usually spongy at the base); 500–1500 mm tall. Leaf blades 100–350 mm long; 2–10 mm wide. Spikelets 1.7–2.5 mm long. Leaf sheaths papery with prominent cross-veins; panicle spike-like, 100–300 mm long, 4–7 mm wide, dense; spikelets laterally compressed; lower glume more or less 1/2 the length of the upper glume.

Flowering December to May. Wet soils in seasonal swamps, marshy places or floodplains; often submerged. Locally common. Biome: Savanna and Grassland. Throughout tropical Africa. Intergrades into *S. chevalieri*, which is a smaller plant that lacks spongy culms and has spikelets more loosely arranged and leaf blades 1–3 mm wide.

Description: Chippindall & Crook 1976 (240), Chippindall 1955 (358), Clayton et al. 1970–1982 (460). Illustration: Chippindall 1955 (fig. 308). Voucher: Smith 2682. PRECIS code 9901240–00800.

Fig 181. Pl. 166.



as the body of the lemma to much longer than the body of the lemma. Palea present; conspicuous but relatively short (small, scale-like); 2-nerved. Lodicules 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit medium sized (8–10 mm); fusiform; hilum long-linear; pericarp fused; embryo small (no more than 1/4 grain length).

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 11$. Arundinoideae; Aristideae. 4 species. South Africa. Mesophytic; glycophytic. Namibia and Transvaal. 3 indigenous species.

References. 1. De Winter. 1965. Bothalia 8: 381.

Species treatment by G.E. Gibbs Russell.

- 1(0). Lemma and awns 30–40 mm long; lateral awns about 1/2 size of median awn; callus minutely bifid . . .
 *S. sp.* (=Muller 2174)
 Lemma and awns more than 50 mm long; lateral awns about same length as median awn; callus not bifid 2
 2(1). Lemmas and awns 50–60 mm long; callus obtuse *S. jucunda*
 Lemma and awns 90–120 mm long; callus acute *S. angolensis*

Sartidia De Winter

Perennial; caespitose (densely so). Culms 800–2000 mm high; herbaceous; unbranched above. Leaf blades linear; rolled. Ligule a fringed membrane, or a fringe of hairs.

Inflorescence panicleate (erect, narrow, often interrupted); open; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 12–30 mm long; not noticeably compressed; disarticulating above the glumes. Glumes two; more or less equal; long relative to the adjacent lemmas; awned, or awnless; non-carinate (rounded on the back); similar (narrow, nerves evanescent). All florets female-fertile only; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; hairless (glabrous or scabrid); without a germination flap; 3 nerved; awned (cf. *Aristida*). Awns triple or trifold, commonly with a basal column (or at least with the three spreading awns twisted together basally); apical; non-geniculate; hairless (glabrous or scabrid); about as long



Fig. 182. *Sartidia angolensis*

Sartidia angolensis (C.E. Hubb.) De Winter

Fig. 182. Pl. 167.

(=*Aristida angolensis* C.E. Hubb.) 1.

Perennial; rhizomatous and tufted (erect); 1000–2000 mm tall. Leaf blades to 350 mm long; 2–4 mm wide (narrowed below). Spikelets 90–120 mm long (including awns). Lateral awns about same length as median awns; callus acute.

Flowering February to July. Grasslands on Kalahari sand, often in depressions. Rare. Biome: Savanna. To Angola and Zambia.

Description: De Winter 1965 (384). Illustration: De Winter 1965 (385). Voucher: De Winter 2779. PRECIS code 9902622–00100.

Sartidia jucunda (Schweick.) De Winter(=*Aristida jucunda* Schweick.) 1.

Tufted perennial; densely tufted and rhizomatous; to 1000 mm tall. Leaf blades to 450 mm long; 3–4 mm wide. Spikelets 50–60 mm long (including awns). Old leaves reddish-brown; lateral awn about the same length as median awn; callus obtuse.

Flowering April to May. Rocky hillsides, altitudes 1300–2000 m. Rare. Biome: Savanna.

Description: De Winter 1965 (384), Chippindall 1955 (307). Illustration: De Winter 1965 (382), Chippindall 1955 (fig. 272). Voucher: Codd 8686. PRECIS code 9902622–00200.

Sartidia sp. (= Muller 2174)

Perennial; rhizomatous and tufted (erect); to 800 mm tall. Leaf blades to 400 mm long; 2–4 mm wide. Spikelets 30–40 mm long. Lateral awns about 1/2 as long as median awns; callus minutely bifid.

Flowering March to June. Hillslopes, probably restricted to serpentine soil. Rare. Endemic.

Voucher: Muller 2174. PRECIS code 9902622–99999.

**Schismus P. Beauv.***Electra* Panz., *Hemisacris* Steud.

Annual, or perennial (infrequently); caespitose (rarely), or decumbent (low). Culms 30–400 mm high; herbaceous; unbranched above. Leaf blades linear to linear-lanceolate; 0.5–2.5 mm wide; flat, or rolled (convolute). Ligule a fringe of hairs.

Inflorescence paniculate; contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 4–8 mm long; compressed laterally (slightly); disarticulating above the glumes, or falling with the glumes (rarely); with conventional internode spacings. Glumes two; more or less equal; markedly shorter than the spikelets to about equalling the spikelets; awnless; similar (herbaceous-membranous). Lower glume 5–7 nerved. Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 5–10. Lemmas similar in texture to the glumes (herbaceous, the lobes and margins hyaline); hairy; 7–9 nerved; incised (to merely emarginate); awnless,

or mucronate (from the sinus), or awned. Awns, when present 1, from the sinus; non-geniculate; much shorter than the body of the lemma to about as long as the body of the lemma. Palea present; relatively long; 2-nerved. Lodicules 2; fleshy; ciliate, or glabrous. Stamens 3. Ovary glabrous. Hilum short; pericarp fused; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 6$. Arundinoideae; Danthonieae. 5 species. Africa, Mediterranean to northwest India. Xerophytic; in open habitats. Namibia, Botswana, Orange Free State, Lesotho, and Cape Province. 4 indigenous species.

References. 1. Conert & Tuerpe. 1974. Abhant. Senck. Naturf. Gesell. 32: 532.

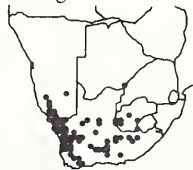
Species treatment by N.P. Barker.

- 1(0). Central awn or mucro of lemmas 1.0–1.5 mm long; lemma backs glabrous, lower third of margin fringed with hairs **S. pleuropogon**
Central awn or mucro of lemma shorter than 1 mm or absent; lemma backs and/or margins pubescent 2
- 2(1). Plants annual; spikelets to 1.5 mm wide, lanceolate, often pale green; hairs on lemmas often club-shaped **S. barbatus**
Plants perennial; spikelets 1.5–4.0 mm wide, ovate, often with a purple colouration; hairs on lemmas never club-shaped 3
- 3(2). Lemmas densely pubescent, hairs 1.0–1.5 mm long, with a short (less than 1 mm long) mucro arising from the sinus between the lemma lobes **S. inermis**
Lemmas sparsely pubescent, hairs short (less than 1 mm long), often arranged only as a row of hairs across the back, mucro very short or absent **S. scaberrimus**

Schismus barbatus (Loefl. ex L.) Thell.

Haasgras.

Fig. 183. Pl. 168.



Annual; tufted; 50–250 mm tall. Leaf blades 10–50 mm long (rarely longer); involute, to 1.5 mm wide. Spikelets 4–7 mm long; 1.5 mm wide. Panicle 10–50 mm long; spikelets 5–10-flowered, usually light green, sometimes purple, often long and narrowly lanceolate; glumes usually closed; lemma backs pubescent, hairs usually club-shaped, lobes obtuse, with or without a short (less than 1 mm long) mucro arising from the sinus.

Flowering June to December. Alluvial soils, disturbed sandy areas. Common. Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. North Africa, Middle East and SW Asia. Natural pasture (for sheep), or weed (in gardens).

Description: Conert & Tuerpe 1974 (532), Stapf 1898–1900 (693), Chippindall 1955 (240). Illustration: Conert & Tuerpe 1974 (fig. 6). Voucher: Oliver, Toelken & Venter 367. PRECIS code 9904050–00100.

Schismus inermis (Stapf) C.E. Hubb.

Perennial; tufted; 120–400 mm tall. Leaf blades to 300 mm long; about 1 mm wide. Spikelets 4.5–7.0 mm long; 2.5–4.0 mm wide. Panicle 25–70 mm long, contracted and dense; spikelets green or purple, 4–6-flowered, ovate; glumes often open; lemmas pubescent, hairs 1.0–1.5 mm





Fig. 183. *Schismus barbatus*

long, never club-shaped, lemma apex minutely lobed with a short mucro (less than 1 mm long), arising from the sinus between the lobes and seldom extending much beyond the lobes.

Flowering June to February. On dense grassy slopes and rocky areas. Common. Biome: Fynbos, Nama-Karoo, and Succulent Karoo. Endemic. May be confused with *Koeleria capensis*, which has a membranous ligule.

Description: Conert & Tuerpe 1974 (532), Stapf 1898–1900 (694), Chippindall 1955 (240). Illustration: Conert & Tuerpe 1974 (fig. 12; spikelet only). Voucher: Archibald 4541/41. PRECIS code 9904050–00200.

Schismus pleuropogon Stapf

Perennial; stoloniferous; 120–250 mm tall. Leaf blades 30–80 mm long; involute, to 1.5 mm wide. Spikelets 5–7 mm long; to 2 mm wide. Panicle 15–80 mm long; spikelets 5–7-flowered, ovate; glumes usually open; lemma backs glabrous but lower 1/3 of the margin is fringed with hairs, lobes short, with a straight awn, 1.0–1.5 mm long, arising from between the lobes.



Flowering November. Moist areas. Rare. Biome: Fynbos. Endemic. There are no specimens of this taxon in PRE. The map locality was obtained from the type locality in the original description.

Description: Conert & Tuerpe 1974 (532), Stapf 1916 Kew Bull. (234). Illustration: Conert & Tuerpe 1974 (fig. 17). PRECIS code 9904050–00300.

Schismus scaberrimus Nees

Perennial; tufted; 100–450 mm tall. Leaf blades 30–200 mm long; to 1.5 mm wide (somewhat scabrid). Spikelets 5–7 mm long; 1.5–2.5 mm wide. Panicle 10–50 mm long; spikelets 4–6-flowered, ovate to broadly ovate; glumes usually quite wide open; lemmas sparsely pubescent with short, scattered hairs across the back, margins tufted to densely hairy, lemma lobes tend to be united with almost no sinus, lacerate-tipped, occasionally with a short (less than 1 mm long) mucro extending beyond the lobes.



Flowering September and October. Sandy areas such as dry river beds. Infrequent. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Conert & Tuerpe 1974 (532), Stapf 1898–1900 (695). Illustration: Conert & Tuerpe 1974 (fig. 15). Voucher: De Winter and Verdoorn 9038. PRECIS code 9904050–00400.

Schizachyrium Nees

Pithecurus Kunth, *Schizopogon* Spreng.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms (50–)300–3200 mm high; herbaceous; branched above. Leaf blades linear. Ligule a fringed membrane (short). Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (the pedicellate broader and flatter or reduced, the G1 sometimes awned); all in heterogamous combinations.

Inflorescence a single raceme, or panicle (of single racemes, sometimes solitary but usually in a spatheate false panicle); spatheate; a complex of 'partial inflorescences' and intervening foliar organs. Spikelet-bearing axes peduncled 'racemes'; solitary (in their spathes, but often fasciated); with substantial rachides; disarticulating at the joints.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only, or sterile. Female-fertile spikelets compressed dorsiventrally (or subterete below); falling with the glumes (and the joint). Glumes present; two; more or less equal; awnless; very dissimilar (lower bicarinate, upper thinner and naviculate). Proximal incomplete florets 1; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline, often stipitiform); incised (or rarely merely prolonged into the awn, without teeth); awned. Awns 1; median; from the sinus, or apical; geniculate; much longer than the body of the lemma. Palea present, or absent; when present very reduced (a minute, hyaline scale — usually absent). Lodicules 2; fleshy; ciliate, or glabrous. Stamens 2–3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. About 60 species. Tropical. Helophytic, or mesophytic, or xerophytic; in open habitats (savanna, rarely beaches or dunes); maritime-arenicolous, or glycophytic. Namibia, Botswana, Transvaal, Swaziland, Natal, and Cape Province. 6 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Plant annual, base delicate 2
 Plant perennial, tufted, base stout 3
 2(1). Lower leaves with blade tips rounded; inflorescence
 exerted from spathe; sessile spikelets 2.5–3.0 mm
 long **S. brevifolium**
 All leaves with blade tips tapering; inflorescence
 partially included in spathe; sessile spikelets 5–6
 mm long **S. exile**
 3(1). Racemes appearing nearly glabrous, hairs present
 only along margins of rachis and pedicels; sessile
 spikelets laterally compressed between rachis
 internode and pedicel; plants turning red
 **S. sanguineum**
 Racemes appearing hairy; sessile spikelets dorsally
 compressed; plants not red 4
 4(3). Raceme hairs yellowish; leaf blades hairy, folded,
 curved; basal sheaths compressed, fanlike, yellow
 turning brown **S. ursulus**
 Raceme hairs white (rarely cream-coloured); leaf
 blades glabrous, expanded; basal sheaths not
 fanlike, not yellow 5
 5(4). No barren branches present below the flowering
 branches; female-fertile (upper) lemma only shortly
 bifid; Namibia, Botswana, Transvaal
 **S. jeffreysii**
 Many barren branches present below the flowering
 branches; female-fertile (upper) lemma bifid for
 1/4–1/3 of its length; Natal **S. rupestre**



Fig. 184. *Schizachyrium sanguineum*

Schizachyrium brevifolium (Swartz) Buese

Delicate annual; 50–600 mm tall. Leaf blades to 70 mm long; 2–5 mm wide. Spikelets (sessile) 2.5–3.0 mm long (pedicellate reduced to a glume). Lower leaves with rounded blade tips; inflorescence exerted from spathe.



Flowering February to April.

Usually grows in open, damp places such as vleis, often shaded by taller grasses. Infrequent. Savanna. Throughout the tropics.

Description: Chippindall 1955 (504). Voucher: Scheepers 933. PRECIS code 9900680–00100.

Schizachyrium exile (Hochst.) Pilg.

(= *S. inclusum* Stent) 2.

Annual; tufted; 500–1000 mm tall. Leaf blades 20–150 mm long; 2–3 mm wide. Spikelets (sessile) 5–6 mm long (pedicellate much smaller). Leaf blades with tapering tips; inflorescence partly enveloped by spathe.



Flowering March to June. Open places, often in poor dry soil. Infrequent. Biome: Savanna. Through tropical Africa to Asia.

Description: Chippindall 1955 (504), Clayton et al. 1970–1982 (756). Voucher: Volk 363. PRECIS code 9900680–00200.

Schizachyrium jeffreysii (Hack.) Stapf

Perennial; loosely tufted; 600–1000 mm tall. Leaf blades to 200 mm long; 2–5 mm wide. Spikelets (sessile) 7–8 mm long (dorsally compressed; pedicellate shorter). Leaves glabrous; inflorescence lacking barren branches; racemes with conspicuous white hairs; female-fertile lemma only shortly bifid.



Flowering February to June. Open veld. Common. Biome: Savanna. Southern tropical Africa. The inflorescence of plants with a single raceme may resemble *Elionurus muticus*, which has leaf blades narrower than 2 mm and is densely tufted.

Description: Chippindall 1955 (503). Voucher: Giess 9926. PRECIS code 9900680–00300.

Schizachyrium rupestre (K. Schum.) Stapf

Perennial; tufted; 300–1500 mm tall. Leaf blades 150–300 mm long; 1–5 mm wide. Spikelets (sessile) 4.0–6.5 mm long (dorsally compressed; pedicellate nearly as long). Inflorescence with many barren branches; racemes with conspicuous white hairs; female-fertile lemma bifid for 1/4–1/3 of its length.



Flowering March. Moist places in coastal bush. Rare. North to Senegal, Nigeria and Tanzania. Known here only by two collections of R.P. Ellis from St. Lucia, far south of its previously reported range.

Description: Clayton et al. 1970–1982 (758). Voucher: Ellis 4497. PRECIS code 9900680–00350.

Schizachyrium sanguineum (Retz.) Alst.

Fig. 184. Pl. 169.

(=*S. semiberbe* Nees) 2.

Rooidekgras, red autumn grass.



Perennial; shortly creeping rhizomatous and tufted; 400–1200 mm tall. Leaf blades 60–300 mm long; to 7 mm wide. Spikelets (sessile) 6–9 mm long (laterally compressed; pedicellate somewhat shorter). Plants conspicuously red in autumn; ligule undivided, strongly curved, blade tips rounded or abruptly pointed; racemes nearly glabrous.

Flowering January to May. Open veld. Very common. Biome: Savanna and Grassland. Throughout tropics. Domestic use (thatching). Vegetatively similar to and often occurring with *Heteropogon contortus*, which has a slightly curved ligule, and forms of *Themeda triandra*, which has a divided ligule and tapering leaf tips.

Description: Chippindall 1955 (502), Clayton et al. 1970–1982 (756). Illustration: Chippindall 1955 (pl. 22), Clayton et al. 1970–1982 (fig. 178). Voucher: Giess 10072. PRECIS code 9900680–00400.

Schizachyrium ursulus Stapf

Perennial; tufted (in dense round tufts); 300–700 mm tall. Leaf blades to 400 mm long; 2–3 mm wide. Spikelets (sessile) 7–8 mm long (dorsally compressed; pedicellate shorter). Basal sheaths yellow, compressed, fanlike, blades hairy, folded, curved; racemes with conspicuous yellowish hairs.



Flowering January to April. Open sour veld. Infrequent. Biome: Savanna and Grassland. Southern tropical Africa.

Description: Chippindall 1955 (503). Voucher: De Winter 273. PRECIS code 9900680–00500.

Schmidtia Steud.*Antoschmidtia* Boiss.

Annual, or perennial (usually viscid); caespitose to decumbent. Culms 150–1000 mm high; herbaceous; branched above. Leaf blades linear to linear-lanceolate; flat, or rolled. *Ligule a fringe of hairs.*

Inflorescence paniculate; open, or contracted; espathate. Spikelet-bearing axes persistent.

Spikelets solitary; 7–10 mm long; compressed laterally (slightly so); disarticulating above the glumes; *not disarticulating between the florets. Hairy callus present.* Glumes two; very unequal to more or less equal; about equalling the spikelets; awnless; similar (lanceolate, membranous, usually green or grey). Incomplete florets distal to the female-fertile florets, 1–2, merely underdeveloped, awned; proximal incomplete florets absent.

Female-fertile florets 3–9. Lemmas decidedly firmer than the glumes (subcoriaceous); without a germination flap; 9 nerved; incised (6 lobed); awned. *Awns* 5 (one from each sinus); median and lateral. The median awn similar in form to the laterals; non-geniculate; about as long as the body of the lemma. Palea present; relatively long (longer than the body of the lemma). Lodicules 2; fleshy; ciliate (sometimes glandular), or glabrous. Stamens 3. Ovary glabrous. Fruit small (about 2.5 mm long); ellipsoid; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C_4 ; XyMS+. PCR sheath outlines uneven. PCR sheath

extensions absent. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Chloridoideae; Pappophoreae. 2 species. Tropical and southern Africa, Cape Verde Is., Pakistan. Xerophytic; in open habitats; glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Launert. 1965. Bol. Soc. Brot. 39: 303–311. 3. Clayton. 1970. FTEA.

Species treatment by G.E. Gibbs Russell.

1(0). Plant perennial, with a woody rootstock; culm bases swollen, clad with white-hairy cataphylls; leaf blades usually less than 7 mm wide

. *S. pappophoroides*
Plant annual, with fibrous roots; culm bases not swollen, not clad with hairy cataphylls; leaf blades usually more than 7 mm wide . . . *S. kalahariensis*



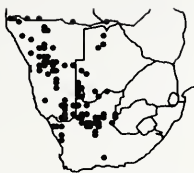
Fig. 185. *Schmidtia pappophoroides*

Schmidtia kalahariensis Stent

Annual; tufted; to 1000 mm tall. Leaf blades 70–150 mm long; 8–10 mm wide. Spikelets 6–17 mm long. Plant coarse, hairy, viscid; culm bases not swollen, lacking cataphylls; leaf blades tapering abruptly at tip.

Flowering throughout the year (but most commonly in mid to late summer). Open veld, usually in poor sandy soils. Common, or locally dominant. Biome: Savanna, Nama-Karoo, Succulent Karoo, and Desert. To Chad and Sudan. Hay and pasture, has a strong unpleasant smell.

Description: Chippindall 1955 (234). Illustration: Chippindall 1955 (fig. 207). Voucher: Theron 1985. PRECIS code 9903610–00100.

**Schmidtia pappophoroides** Steud.

(=*S. bulbosa* Stapf) 2.

Kalahari sandkweek, vaalgras.

Perennial; stoloniferous and tufted; 150–900 mm tall. Leaf blades 50–160 mm long; 2–7 mm wide. Spikelets 8–15 mm long. Plant hairy to nearly glabrous; culm bases swollen, clad by hairy cataphylls; leaf blades tapering gradually to a long fine point.

Flowering throughout the year (but most commonly in summer). Open veld in a variety of soils and habitats. Common, or locally dominant. Savanna, Nama-Karoo, Succulent Karoo and Desert. To eastern and central tropical Africa and in Cape Verde Islands. Variable in size, hairiness and awn length.

Description: Chippindall 1955 (232), Clayton et al. 1970–1982 (165). Illustration: Chippindall 1955 (fig. 206), Clayton et al. 1970–1982 (fig. 54). Voucher: Werdermann & Oberdieck 2369. PRECIS code 9903610–00200.

Fig. 185. Pl. 170.

**Schoenefeldia Kunth**

Annual, or perennial; caespitose. Culms 700–1200 mm high; herbaceous. Leaf blades linear. Ligule a fringed membrane (short).

Inflorescence of spike-like main branches (usually 2–6 sessile, flexuous spikes); digitate or subdigitate; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate; all sessile; strongly compressed laterally; disarticulating above the glumes. Hairy callus present. Glumes two; very unequal; long relative to the adjacent lemmas (exceeding the lemma); awned (G1, sometimes), or awnless; similar (persistent, narrow or setaceous, subhyaline). All florets female-fertile, or a solitary distal incomplete floret present; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (often blackened at maturity); 3 nerved; incised; awned. Awns 1; median; from the sinus; non-geniculate, or geniculate; much longer than the body of the lemma (awns very long, flexuous, tangling one another). Palea present. Lodicules 2; fleshy; glabrous. Stamens 2–3. Ovary glabrous. Fruit ellipsoid; hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 2 species. Tropical Africa, Asia. In open habitats (savanna, hardpans and seasonally flooded flats). Transvaal. 1 indigenous species.

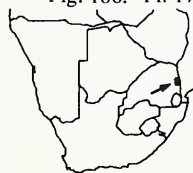
References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Schoenefeldia transiens (Pilg.) Chiov.

(=*Chloris transiens* Pilg.) 1.

Fig. 186. Pl. 171.



Perennial; densely tufted; 700–1200 mm tall. Leaf blades to 350 mm long; 5 mm wide. Spikelets 3.5–5.0 mm long. Spikelets small in comparison to the awns, awns of the female-fertile and sterile lemmas 10–25 mm and 25–45 mm long respectively, curving gracefully around the spike.

Flowering January to February. Heavy soils and seasonally flooded flats. Rare. Biome: Savanna. Tropical Africa. Reported to be cleistogamous.

Description: Clayton et al. 1970–1982 (309). Illustration: Clayton et al. 1970–1982 (fig. 86). Voucher: Gertenbach 4931. PRECIS code 9902950–00100.

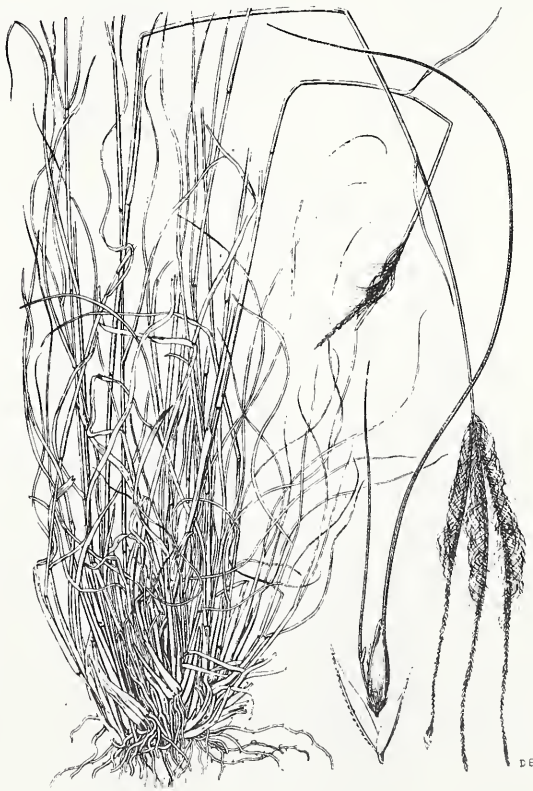


Fig. 186. *Schoenefeldia transiens*

Secale L.

Annual (rarely perennial); caespitose (or solitary culms). Culms 200–1500 mm high; herbaceous; unbranched above. *Leaves auriculate*. Leaf blades linear; flat, or rolled (convolute). Ligule an unfringed membrane.

Inflorescence a single spike (laterally compressed, distichous); espatheate. Spikelet-bearing axes disarticulating, or persistent (in cultivated forms); disarticulating at the joints.

Spikelets solitary; distichous; 10–18 mm long; compressed laterally; falling with the glumes (and the joint), or not disarticulating (in cultivated forms). Glumes two; very unequal, or more or less equal; decidedly shorter than the adjacent lemmas; awned; similar (subulate). *Upper glume*

1 nerved. All florets female-fertile, or distal incomplete florets also present, merely underdeveloped (a single rudiment); proximal incomplete florets absent.

Female-fertile florets 2–3. Lemmas less firm than the glumes, or similar in texture to the glumes; 5 nerved; entire; awned. Awns 1; median; apical; non-geniculate; much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; ciliate. Stamens 3. Ovary hairy. Fruit medium sized, or large; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Triticodae; Triticeae. 5 species. Mediterranean, eastern Europe to central Asia, and South Africa. Mesophytic, or xerophytic; in open habitats (sandy soils and dry hillsides); glycophytic. Cape Province. 1 indigenous species.

Intergeneric hybrids with *Triticum* (*X Triticosecale* Wittmack), *Agropyron*, *Aegilops* (*X Aegilosecale* Ciferri & Giacom.), *Elytrigia*. *X Agrotisecale* Ciferri & Giacom. = *Agropyron* \times *Secale* \times *Triticum*.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.

Secale africanum Stapf

Wild rye, wilderog.

Fig. 187. Pl. 172.

Perennial; loosely tufted; to 1000 mm tall. Leaf blades 200–350 mm long; 4–9 mm wide. Spikelets 10–15 mm long (excluding awns). Spike 80–120 mm long, linear, very dense, rachis fringed with short hairs, breaking up at maturity; lemma keel minutely hairy, awn up to 20 mm long, surface scabrid.

Flowering December. Undisturbed places on riverbanks. Rare. Biome: Nama-Karoo. Endemic. Potential pasture (liked by birds and stock). Reported to have occurred abundantly during earlier years, but now apparently restricted to rare patches on a farm Voelfontein in the Sutherland district. Distinguished from cultivated rye, *S. cereale*, which is annual, has the lemma keel fringed with stiff hairs and the surface smooth, awns up to 50 mm long and a rachis that does not break up at maturity.

Description: Stapf 1898–1900 (764), Chippindall 1955 (70). Illustration: Chippindall 1955 (fig. 43). Voucher: Schweickerdt 1927. PRECIS code 9904390–00100.

Sehima Forssk.

Hologamium Nees.

Annual, or perennial; caespitose. Culms 200–1000 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear. *Ligule a fringed membrane*. Plants bisexual, with bisexual spikelets. *The spikelets of sexually distinct forms on the same plant; overtly heteromorphic; all in heterogamous combinations.*

Inflorescence a single raceme (a single, curved, culm-like 'raceme' with embedded spikelets); espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (spiciform, laterally compressed, curved); solitary; with substantial rachides (compressed); disarticulating at the joints.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only, or sterile, flat, often with G1 large and strongly nerved, lemmas awnless. Female-fertile spikelets



Fig. 187. *Secale africanum*

compressed laterally (usually, more or less); falling with the glumes. Glumes two; more or less equal; awned (G2 with an apical bristle-like awn, G1 2-dentate or 2-mucronate); very dissimilar (lower 2-keeled and 2-winged, upper naviculate-subulate). *Proximal incomplete florets* 1; paleate, palea fully developed; male.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); incised; awned. Awns 1; median; from the sinus; geniculate; much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10, 17$, and 20 . Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 5 species. Warm Africa, India, Australia. Helophytic to mesophytic; in open habitats (savanna, sometimes on heavy clay); glycophytic. Namibia, Botswana, Transvaal, Swaziland, and Natal. 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by G.E. Gibbs Russell.



Fig. 188. *Sehima galpinii*

- 1(0). Annual; lower glume of sessile spikelets deeply grooved in lower half, tip membranous, deeply 2-toothed *S. ischaemoides*
Perennial, densely tufted; lower glume of sessile spikelets flat or slightly convex, tip not membranous, not toothed *S. galpinii*

Sehima galpinii Stent

Dekgras.

Robust perennial; tufted; to 1800 mm tall. Leaf blades 3–6 mm wide. Spikelets (sessile) 12–15 mm long (pedicellate somewhat shorter). Lower glume of sessile spikelets flattish, tip not toothed.

Flowering October to April. Black turf soil. Infrequent. Biome: Savanna. Southern tropical Africa. Domestic use (thatching). Can be distinguished from other robust grasses with solitary racemes, such as *Urelytrum agropyroides* and *Trachypogon spicatus*, by its ligule which is a fringe of hairs.

Description: Chippindall 1955 (489). Illustration: Chippindall 1955 (pl. 17). Voucher: Galpin M557. PRECIS code 9900130-00100.

Sehima ischaemoides Forssk.

Annual; 200–600 mm tall. Leaf blades 50–300 mm long; 1–3 mm wide. Spikelets (sessile) 9–15 mm long. Lower glume of sessile spikelets deeply grooved below, tip deeply 2-toothed.

Flowering February to May. Dry soils in savanna. Conservation status not known. Biome: Savanna. Tropical Africa to Pakistan.

Description: Clayton et al. 1970–1982 (750). Voucher: De Winter 2932. PRECIS code 9900130-00200.

Setaria P. Beauv.

Acrochaete Peter, *Chaetochloa* Scribn., *Cymbosetaria* Schweick., *Miliastrum* Fabric., *Tansaniochloa* Rauschert.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 100–3200 mm high; herbaceous; branched above, or unbranched above. Leaf blades occasionally sagittate or hastate — then perhaps referable to *Cymbosetaria*; flat, or folded; pseudopetiolate (occasionally), or not pseudopetiolate. *Ligule* a fringed membrane (narrow), or a fringe of hairs. Plants with hermaphrodite florets. The spikelets of sexually distinct forms on the same plant (when clustered, often not all fully developed), or all alike in sexuality.

Inflorescence of spike-like main branches (not uncommonly so — e.g., in Sect. *Ptychophyllum* — though this is ignored in many published keys), or a false spike, with clusters of spikelets on reduced axes, or paniculate; open, or contracted; axes not ending in spikelets (produced into 'bristles' beyond the spikelets); espatheate. Spikelet-bearing axes persistent.

Spikelets with 'involucres' of 'bristles', or (at least some of them) subtended by solitary 'bristles' (e.g., in Sect. *Ptychophyllum*); not in distinct 'long-and-short' combinations. Female-fertile spikelets 2–4 mm long; compressed dorsiventrally; falling with the glumes, or not disarticulating (in cultivated forms). Glumes two; relatively large; very unequal; awnless; membranous. *Proximal incomplete*

Fig. 188. Pl. 173.



florets 1; paleate, or epaleate, palea fully developed to reduced; male, or sterile.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (crustaceous); rugose; becoming indurated; hairless; usually *non-carinate* (but *cymbiform* in species perhaps referable to *Cymbosetaria*); having the margins tucked in onto the palea; with a clear germination flap; 1–5 nerved; entire; awnless (usually apiculate). Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small, ellipsoid to subglobose; hilum short; embryo large.



Fig. 189. *Setaria sphacelata* var. *sphacelata*

Photosynthetic pathway. C₄; NADP-ME (5 species); XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$ and 10. Panicoideae; Panicoideae; Paniceae. About 110 species. Tropical and warm temperate. Generally mesophytic; in shade (e.g. *S. palmifolia*), or in open habitats (woodland, grassland, weedy places). Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 19 indigenous species, 2 naturalized species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Lower glume 1-nerved 2
- Lower glume 3-nerved 3
- 2(1). Bristles antrorsely barbed, with sparse long white hairs; plants perennial ***S. rigida***
- Bristles retrorsely barbed, without hairs; plants annual ***S. verticillata***
- 3(1). Culm nodes sparsely or densely pubescent 4
- Culm nodes glabrous 7
- 4(3). Leaf blades saggitate at the base; panicle open ***S. appendiculata***
- Leaf blades linear at the base; panicle spike-like or open 5
- 5(4). Panicle open, with branches spreading or sub-erect; leaf blades lanceolate, plicate at first and then flat; spikelets with a solitary bristle ... ***S. homonyma***
- Panicle densely spike-like; leaf blades linear, flat or folded; spikelets with 4–8 bristles 6
- 6(5). Spikelets 2.5–3.0(–3.7) mm long; basal plant parts with a light reddish or yellowish colour; rhizomes not robust, mostly oblique; panicle often interrupted at the base, tapering at the apex ***S. incrassata***
- Spikelets 3.5–5.0 mm long; basal plant parts dark coloured; rhizomes very robust and branches far apart; panicle usually dense, cylindrical to the apex ***S. nigrirostris***
- 7(3). Leaf blades pseudopetiolate at the base ***S. sagittifolia***
- Leaf blades linear or tapering at the base 8
- 8(7). Plants annual 9
- Plants perennial 12
- 9(8). Spikelets disarticulating above the glumes; lower lemma smooth; panicle spike-like, 8–24 mm wide ***S. italica***
- Spikelets disarticulating below the glumes; lower lemma rugose; panicle spike-like or open, to 15 mm wide 10
- 10(9). Panicle open and lax; spikelet tips mucronate and deflexed; bristles delicate and solitary, terminating the inflorescence branches ***S. finita***
- Panicle cylindrical and spike-like; spikelet tips acute and not deflexed; bristles rigid, in clusters of 4–10 from the spikelet bases 11
- 11(10). Upper lemma coarsely rugose; bristles at least two times the spikelet length, yellowish, brownish or copper coloured; panicle usually ovate, to 5 times longer than wide; growing under trees or bushes in drier bushveld areas ***S. ustilata***
- Upper lemma finely rugose; bristles usually one and a half times the spikelet length, mostly bright yellow or purple-brown; panicle usually linear and slender, about 10 times longer than wide; common weed in moist disturbed areas and cultivated lands ***S. pallide-fusca***
- 12(8). Panicle open, usually lax; bristles solitary, delicate 13
- Panicle cylindrical, spike-like; bristles in clusters of

- 6–10 (or in *S. obscura* solitary and very sparse) 16
- 13(12). Leaf blades flat, 2–6 mm wide . . . *S. pseudaristata*
Leaf blades plicate (sometimes only visible at the
base of young leaves), 5–110 mm wide 14
- 14(13). Plants robust, 900–3000 mm tall; culms 4–10 mm
in diameter; leaves 30–110 mm wide; leaf
sheaths usually densely pubescent
. *S. megaphylla*
Plants not robust, 400–1500 mm tall; culms 2–3(–5)
mm in diameter; leaves 4–25(–30) mm wide; leaf
sheaths usually glabrous 15
- 15(14). Leaf blades narrowly lanceolate; 5–35 mm wide,
coarsely plicate, flat; plants loosely tufted; upper
lemma smooth or obscurely rugose
. *S. plicatilis*
Leaf blades linear, 1.5–7.0(–13.0) mm wide, finely
plicate, flat or involute; plants densely tufted;
upper lemma rugose *S. lindenberghiana*
- 16(12). Bristles solitary and sparse; upper lemma smooth
and deeply grooved; spikelets 4.0–4.6 mm long;
plants of the Natal Drakensberg *S. obscura*
Bristles in clusters of 6–10; upper lemma rugose
and rounded on the back; spikelets less than 4
mm long; very widespread distribution 17
- 17(16). Rhizome bare, very slender, knotty, branched;
culms wiry *S. geniculata*
Rhizome covered with basal sheaths, thick, oblique
or creeping, not branching; culms not wiry 18
- 18(17). Plants very robust, to 3000 mm tall, occasionally
with stilt roots; culms 6–10 mm in diameter; leaf
blades 8–17 mm wide; panicle 150–300 mm long
. *S. sphacelata* var. *splendida*
Plants slender to fairly robust, 300–2000 mm tall,
lacking stilt roots; culms 1–6 mm in diameter;
leaf blades 2–10 mm wide; panicle 25–250 mm
long 19
- 19(18). Bristles mostly dark purple-brown or darkening
only towards the tips, occasionally yellowish;
leaves mostly basal, not more than 2 mm wide,
usually folded or inrolled, old leaves curly;
panicle 25–45 mm long
. *S. sphacelata* var. *torta*
Bristles golden-yellow; leaves basal or cauline, 2–7
mm wide, usually flat; old leaves not curly;
panicle 30–250 mm long 20
- 20(19). Culms 4–10-noded, 3–6 mm in diameter, to 2000
mm tall; leaf blades 3–10 mm wide, often folded;
panicle 70–250 mm long
. *S. sphacelata* var. *sericea*
Culms 2–4-noded, 1–3 mm in diameter, to 1000
mm tall; leaf blades 2–5 mm wide, flat; panicle
30–150 mm long
. *S. sphacelata* var. *sphacelata*

Setaria appendiculata (Hack.) Stapf

Perennial; loosely tufted and rhizomatous (rhizome oblique); 500–1000 mm tall. Leaf blades 70–300 mm long; 3–12 mm wide. Spikelets 2.0–2.7 mm long. Culm nodes hairy; leaf blades sagittate at the base; panicle open, linear to lanceolate; bristles solitary; lower glume 3-nerved.

Flowering January to May. Rocky outcrops, among bushes and in dry riverbeds, often in shady places. Locally common (drier western parts). Biome: Savanna, Nama-Karoo, and Desert. ?Endemic. Distinguished from other hairy-noded *Setaria* species by the sagittate leaf bases. *S. sagittifolia* also has sagittate leaf blades, but it has glabrous culm nodes and pseudopetiolate leaf blades.



Description: Launert 1970 (160:171), Stapf 1930 (833), Stapf 1898–1900 (422), Chippindall 1955 (343), Clayton et al. 1970–1982 (532). Illustration: Chippindall 1955 (fig. 298). Voucher: Giess 8477. PRECIS code 9901280–00200.

Setaria finita Launert

Annual; loosely tufted (culms erect or geniculate and rooting at the nodes); 350–1000 mm tall. Leaf blades 100–350 mm long; 4–12 mm wide. Spikelets 3.2–3.5 mm long. Culm nodes glabrous; panicle open, up to 250 mm long; branches delicate and lax; spikelet tips mucronate and deflected outwards; bristles solitary and delicate; lower glume 3-nerved; lemmas finely rugose.

Flowering January to March. Mostly in the shade along rivers, occasionally in disturbed places. Rare. Biome: Savanna. ?Endemic. An open, lax panicle, mucronate spikelets and delicate, solitary bristles distinguish this species from *S. italica*, *S. ustilata* and *S. pallide-fusca*, which are annual and have glabrous culm nodes.

Description: Launert 1970 (160:171). Voucher: Giess 7771, Smook 5076. PRECIS code 9901280–00600.



Setaria geniculata (Lam.) Beauv.

Knotroot, bristle grass.

Perennial; (rhizome knotty, slender and branching profusely); 300–800 mm tall. Leaf blades 150–300 mm long; 3–4 mm wide. Spikelets 2.2–2.7 mm long. Culm nodes glabrous; panicle cylindrical, spike-like; spikelets subtended by 2–3 bristles; bristles yellowish; lower glume 3-nerved; lower lemma rugose.

Flowering December, January, and June. Mostly in cultivated lands, occasionally adventive in disturbed areas. Rare. Naturalized from tropical America. Biome: Fynbos (urban areas). Tropical and temperate America. The panicle is similar to that of *S. pallide-fusca*, which is annual.

Description: Hitchcock & Chase 1950 (697), Chippindall 1955 (355). Illustration: Hitchcock & Chase 1950 (fig. 1564). Voucher: Taylor 7626. PRECIS code 9901280–00800.



Setaria homonyma (Steud.) Chiov.

Fan-leaved bristle grass.

Annual; loosely tufted (culms erect or geniculately ascending and rooting at the nodes); 250–1000 mm tall. Leaf blades 45–300 mm long; 5–35 mm wide. Spikelets 2.3–2.8 mm long. Culm nodes pubescent; leaf blades lanceolate, plicate at first; panicle open with stiff, spreading or suberect branches; bristles solitary; lower glume 3-nerved.

Flowering February to June. Shady places in woodlands, forests, on riverbanks and floodplains on moist sandy soils, often in disturbed areas and cultivation. Infrequent. Biome: Savanna. Northwards to Cameroun and Ethiopia, also in India. Natural pasture (average forage value), or weed (in disturbed areas). Distinguished from other hairy-noded *Setaria* species by plicate, lanceolate leaf blades.

Description: Launert 1970 (160:171), Stapf 1930 (857), Chippindall & Crook 1976 (86), Chippindall 1955 (343), Clayton et al. 1970–1982 (536). Voucher: Smook 1984. PRECIS code 9901280–01000.



Setaria incrassata (Hochst.) Hack.

(=*S. eylesii* Stapf & C.E. Hubb.) 2; (=*S. gerrardii* Stapf) 2; (=*S. holstii* Herr.) 2; (=*S. pabularis* Stapf) 2; (=*S. palustris* Stapf) 2; (=*S. perberbis* De Wit) 2; (=*S. phragmitoides* Stapf) 2; (=*S. porphyrantha* Stapf) 2; (=*S. rudifolia* Stapf) 2; (=*S. woodii* Hack. subsp. *bechuanica* De Wit) 2; (=*S. woodii* Hack. var. *fonssalutis* De Wit) 2; (=*S. woodii* Hack. var. *woodii*) 2.



Perennial; rhizomatous and tufted (with an oblique creeping rhizome); 300–2000 mm tall. Leaf blades 150–600 mm long; 3–14 mm wide. Spikelets 2.5–3.0(–3.7) mm long. Basal parts showing a reddish straw colour; culm nodes hairy; panicle spike-like, tapering towards the tip, often interrupted in the lower part; lower glume 3-nerved.

Flowering October to May. Mostly on black clay in moist areas such as swamps and vleis, but also on streambanks, forest margins and rocky hillsides. Common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Tropical Africa. Very similar to *S. nigrirostris*, which has its rhizome well developed and much branched, basal parts dark coloured and spikelets 3.5–5.0 mm long.

Description: Stapf 1930 (790), Stapf 1898–1900 (424), Chippindall 1955 (346), Clayton et al. 1970–1982 (525). Voucher: Smook & Gibbs Russell 2162. PRECIS code 9901280–01050.

Setaria italica (L.) Beauv.

Foxtail millet.

Annual; culms erect, solitary to densely tufted; 350–1500 mm tall. Leaf blades 150–450 mm long; 6–20 mm wide. Spikelets 2.0–3.5 mm long. Culm nodes glabrous; leaves mainly cauline; panicle spike-like, 8–24 mm wide; spikelets disarticulating above the glumes; lower glume 3-nerved; lower lemma smooth.

Flowering January to April. In gardens or cultivation and other disturbed areas. Rare (in the natural state). Naturalized from Asia. Biome: Savanna. Tropical regions worldwide. Cultivated mainly for bird seed, but not extensively in South Africa. Uniquely distinguished in *Setaria* by spikelets that disarticulate above the glumes.

Description: Stapf 1930 (820), Stapf 1898–1900 (428), Chippindall 1955 (353), Clayton et al. 1970–1982 (520 & 524). Illustration: Hitchcock & Chase 1950 (fig. 1580). Voucher: Van der Schijff PRE33148. PRECIS code 9901280–01100.

Setaria lindenberghiana (Nees) Stapf

(=*S. phillipsii* De Wet) 2.

Bergsetaria, mountain bristle grass.

Perennial; rhizomatous (rhizomes short and creeping), or tufted (densely); 300–1200 mm tall. Leaf blades 100–450 mm long; 1.5–7.0(–10.0) mm wide. Spikelets 2.0–3.5 mm long. Culm nodes glabrous; leaf blades linear, finely plicate, flat or inrolled; panicle open or loosely contracted; bristles solitary; lower glume 3-nerved; lower lemma rugose.

Flowering October to May. Usually in crevices on rocky or stony hillsides but also in open woodland and forests. Common. Biome: Fynbos, Savanna, and Grassland. Northwards into tropical Africa. Pasture (palatable forage

and hay; fairly drought resistant but susceptible to frost). Intergrades into *S. plicatilis*, which is loosely tufted and has narrowly lanceolate, coarsely plicate leaf blades and smooth to obscurely rugose upper lemmas.

Description: Stapf 1930 (848), Chippindall & Crook 1976 (89), Stapf 1898–1900 (422), Chippindall 1955 (343), Clayton et al. 1970–1982 (537). Voucher: Smook 2664, Smook 2831. PRECIS code 9901280–01200.



Fig. 190. *Setaria lindenberghiana*



Fig. 190. Pl. 174.

Setaria megaphylla (Steud.) Dur. & Schinz

(=*S. chevalieri* Stapf ex Stapf & C.E. Hubb.) 2; (= *S. insignis* De Wit) 1.

Riffelblaarsetaria, ribbon bristle grass.

Very tall, robust perennial; shortly rhizomatous and tufted (culms erect and occasionally rooting at the nodes); 900–3000 mm tall. Leaf blades 150–800 mm long; 10–110 mm wide. Spikelets 2–3 mm long. Culms 4–10 mm in diameter, nodes glabrous; leaf sheaths usually densely pubescent or at least with hairy margins; leaf blades lanceolate, conspicuously plicate; panicle open, 400–600 mm long; bristles solitary; lower glume 3-nerved.

Flowering September to May. Riverine or forest grass on damp soils, mostly in shade, extending to forest margins and disturbed places such as roadcuttings. Locally common. Biome: Savanna, Grassland, and Desert. Tropical Africa and America with a few records from India. Natural pasture (very palatable), or ornamental (in gardens). Intergrades into *S. plicatilis*, which is a smaller plant with much narrower leaves and a shorter, sparser panicle. Also closely related to *S. lindenberghiana*, which has much narrower, linear leaves that are finely plicate.

Description: Stapf 1930 (840), Chippindall & Crook 1976 (84), Chippindall 1955 (341), Clayton et al. 1970–1982 (539 & 541). Illustration: Chippindall 1955 (fig. 296 & 297). Voucher: Smook 5480. PRECIS code 9901280–01350.

Setaria nigrirostris (Nees) Dur. & Schinz

Perennial; rhizomatous (rhizome very well developed and much branched), or tufted (with few basal leaves); 500–1200 mm tall. Leaf blades 100–550 mm long; 4–10 mm wide. Spikelets 3.5–5.0 mm long. Basal plant parts very robust and dark coloured; culm nodes hairy; panicle spike-like, usually cylindrical to the tip; spikelets with distinct dark tips; lower glume 3-nerved.

Flowering October to April. Often on black turf in open grassland or on riverbanks. Common. Biome: Savanna and Grassland. USA. Very similar to *S. incrassata*, which has its rhizome oblique and creeping, basal parts straw-coloured and spikelets 2.5–3.0(–3.7) mm long.

Description: Stapf 1898–1900 (423), Chippindall 1955 (345). Illustration: Chippindall 1955 (fig. 300). Voucher: Liebenberg 8373. PRECIS Code 9901280–01500.

Setaria obscura De Wit

Perennial; hard and densely tufted; 500–1000 mm tall. Leaf blades 100–350 mm long; 3–4 mm wide. Spikelets 4.0–4.6 mm long. Culm nodes glabrous; leaf blades rigid and spiny-tipped; panicle spike-like; bristles solitary; spikelets disarticulating below the glumes; lower glume 3-nerved; lower lemma smooth and deeply grooved.

Flowering November to April. Stream banks in high mountain grassland above 2000 m. Rare. Biome: Grassland. Endemic. The deep groove on the back of the lower lemma and the notably long spikelets of this species are unique in our *Setaria* species.

Description: Chippindall 1955 (344). Illustration: Chippindall 1955 (fig. 299). Voucher: Killick 1614. PRECIS code 9901280–01600.

Setaria pallide-fusca (Schumach.) Stapf & C.E. Hubb.

Garden bristle grass, tuin-setaria.

Annual; loosely tufted; 300–900 mm tall. Leaf blades 45–170 mm long; 5–9 mm wide. Spikelets 2.0–2.8 mm long. Culm nodes glabrous; panicle cylindrical, spike-like, normally 10 times longer than wide; spikelets subtended by 6–10 bristles; bristles often bright yellow but sometimes dark purple-brown; lower glume 3-nerved; lower lemma very finely rugose.

Flowering December to April. In damp soils in disturbed, weedy places and cultivation. Common. Biome: Savanna, Grassland, Nama-Karoo and Succulent Karoo. Tropics worldwide. Domestic use (twisted into ropes by Basothos to bind grain sheaves), or pasture (natural; average to good forage value), or weed (colonizer of bare ground). Closely related to *S. ustilata*, which has a very coarsely rugose lower lemma and grows in the shade of bushes or trees in the drier bushveld regions.

Description: Launert 1970 (160:172), Chippindall 1955 (353), Clayton et al. 1970–1982 (531). Illustration: Chippindall 1955 (fig. 305). Voucher: Smook & Gibbs Russell 2177. PRECIS code 9901280–01800.

Setaria plicatilis (Hochst.) Engl.

Breeblaarpolgras, folded leaf tussock grass.

Loosely caespitose perennial; shortly rhizomatous and tufted; 500–1500 mm tall. Leaf blades 100–350 mm long; 8–35 mm wide. Spikelets 2.5–3.3 mm long. Culm nodes glabrous; leaf blades narrowly lanceolate and coarsely plicate; panicle open; bristles solitary; lower glume 3-nerved; lower lemma smooth or obscurely rugose.

Flowering October to March. Coastal and inland forests in semi-shade, extending to forest margins and occasionally into woodlands. Locally common. Biome: Savanna and Forest. Tropical Africa to Sudan, Ethiopia and Yemen. Intermediate between *S. lindenberghiana*, which is densely caespitose, has much narrower, finely plicate, linear leaves and a rugose lemma and *S. megaphylla*, which is very robust with leaf blades up to 800 mm long and 110 mm wide.

Description: Stapf 1930 (847), Clayton et al. 1970–1982 (538). Voucher: Culverwell 643, Van Jaarsveld 177. PRECIS code 9901280–02000.

Setaria pseudaristata (Peter) Pilg.

(=*S. tenuiseta* De Wit) 2.

Perennial; shortly rhizomatous and tufted (culms erect but sometimes very slender); 500–1000 mm tall. Leaf blades 100–300 mm long; 2–6 mm wide. Spikelets 3.0–3.5 mm long. Culm nodes glabrous; leaf blades flat, not plicate; panicle open, lax; bristles solitary, delicate; lower glume 3-nerved; lemma rugose.

Flowering February to March. In the shade of riverine forest. Rare. Biome: Savanna. Tropical Africa. Very similar to *S. plicatilis*, which has plicate leaf blades.

Description: Chippindall 1955 (343), Clayton et al. 1970–1982 (535). Voucher: De Winter 782. PRECIS code 9901280–02250.

Setaria rigida Stapf

Robust, erect perennial; rhizomatous (rhizome stout and oblique); 1000–1800 mm tall. Leaf blades 100–300 mm long; 3–6 mm wide (often inrolled). Spikelets 2.3–2.8 mm long. Panicle spike-like, up to 200 mm long; bristles often grooved and with sparse long hairs in the lower part; lower glume 1-nerved.

Flowering February to March. On stream banks and in swampy areas. Infrequent. Locally common. Biome: Savanna and Grassland. Endemic. Distinguished from *S. verticillata*, which also has 1-nerved lower glumes, but which is annual and has retrorsely barbed bristles.

Description: Stapf 1898–1900 (426), Chippindall 1955 (352), Clayton et al. 1970–1982 (525). Voucher: Smook 5539. PRECIS code 9901280–02300.



Description: Launert 1970 (160:172), Chippindall 1955 (351), Clayton et al. 1970–1982 (528). Illustration: Chippindall 1955 (fig. 302 & 303). Voucher: Smook 5437, Codd 5373. PRECIS code 9901280–02500.

Setaria sagittifolia (A. Rich.) Walp.

(=*Cymbosetaria sagittifolia* (A. Rich.) Schweick.) 2.

Arrow grass.

Slender annual; loosely tufted; 120–800 mm tall. Leaf blades 50–300 mm long; (3–)5–11(–18) mm wide. Spikelets 2 mm long; 1–2 mm wide. Culm nodes glabrous; leaf blades (at least the lower ones) pseudopetiolate, bases sagittate with lobes 2–30 mm long; panicle open, racemes secund; bristles solitary; lower glume 3-nerved; lower lemma rugose.

Flowering January to March. Shady places in Savanna woodland or open glades in forests. Infrequent. Biome: Savanna and Forest. Northwards to Sudan and Yemen. Natural pasture. Our only other *Setaria* with sagittate leaf bases, *S. appendiculata*, lacks pseudopetioles.

Description: Chippindall 1955 (355), Clayton et al. 1970–1982 (533). Illustration: Chippindall 1955 (fig. 306), Clayton et al. 1970–1982 (fig. 128). Voucher: Smook 5397. PRECIS code 9901280–02450.



Fig. 191.

Setaria sphacelata (Schumach.) Moss var. **sphacelata**

(=*S. decipiens* De Wit) 2; (= *S. flabellata* Stapf subsp. *flabellata*) 2; (= *S. neglecta* De Wit) 2; (= *S. perennis* Hack.) 2; (= *S. sphacelata* (Schumach.) Moss subsp. *aquamontana* De Wit) 2; (= *S. sphacelata* (Schumach.) Moss var. *stolonifera* De Wit) 2; (= *S. stenantha* Stapf) 2.



Fig. 189.

Fairly robust perennial; shortly or obliquely rhizomatous and tufted; 400–1000 mm tall. Leaf blades 100–350 mm long; 2–5 mm wide. Spikelets 1.5–3.5 mm long. Culms 2–4 noded, 1–3 mm in diameter; nodes glabrous; sheaths and leaves glabrous, sparsely or densely hairy; panicle spike-like, 30–150 mm long; bristles golden-yellow to reddish-brown; lower glume 3-nerved; lemma rugose.

Flowering October to June. Occupies a wide range of habitats ranging from streamsides and moist places to rocky hillsides, usually on well-drained soils. Common. Biome: Fynbos, Savanna, and Grassland. Tropical east Africa. Cultivated hay and pasture. Very difficult to separate from *S. sphacelata* var. *sericea*, which is larger with wider leaf blades. Intermediates are common.



Fig. 191. *Setaria sagittifolia*

Setaria sphacelata (Schumach.) Moss var. **sericea** (Stapf) Clayton

(= *S. almaspicata* De Wit) 2;
(= *S. anceps* Stapf ex Massey) 2;
(= *S. cana* De Wit) 2; (= *S.*
flabelliformis De Wit) 2; (= *S.*
sphacelata (Schumach.) Moss
subsp. *nodosa* De Wit) 2; (= *S.*
sphacelata (Schumach.) Moss
subsp. *pyropea* De Wit) 2.



Perennial; shortly rhizomatous and tufted; 1000–2000 mm tall. Leaf blades 100–500 mm long; 3–10 mm wide. Spikelets 1.5–3.5 mm long. Culms 4–10-noded, 3–6 mm in diameter, nodes glabrous; basal sheaths and leaves glabrous, densely or sparsely pubescent; panicle spike-like, 70–250 mm long; bristles golden-yellow to reddish brown; lower glume 3-nerved; lower lemma rugose.

Flowering October to June. Occupies a wide range of habitats ranging from riversides and swampy areas to rocky hillsides. Common. Biome: Savanna and Grassland. Tropical Africa, cultivated elsewhere. Good hay and pasture. Intergrades with *S. sphacelata* var. *sphacelata*, which is a smaller plant with narrower leaves, and *S. sphacelata* var. *splendida*, which is larger, robust and has wider leaves.

Description: Chippindall 1955 (349, 346, 351), Clayton et al. 1970–1982 (529). Voucher: Smook 2583, Webster 8. PRECIS code 9901280–02455.

Setaria sphacelata (Schumach.) Moss var. **splendida** (Stapf) Clayton

(= *S. splendida* Stapf) 2.



Extremely robust, almost reed-like perennial; shortly rhizomatous and tufted (usually with only a few basal leaves); 1800–3000 mm tall. Leaf blades 300–800 mm long; 6–18 mm wide. Spikelets 2.3–2.7 mm long. Plants and culm nodes glabrous; panicle spike-like, 150–300(–500) mm long; bristles golden-yellow, 7–15 per spikelet cluster; lower glume 3-nerved; upper lemma rugose.

Flowering January to June. Swampy areas or floodplains, often in the water. Rare (in the wild but often cultivated). Biome: Savanna. Scattered localities northwards through east Africa to Sudan. Good hay and pasture. The most robust variety in the *S. sphacelata* complex.

Description: Stapf 1930 (799), Chippindall 1955 (351), Clayton et al. 1970–1982 (530). Voucher: Killick & Leistner 3412. PRECIS code 9901280–02570.

Setaria sphacelata (Schumach.) Moss var. **torta** (Stapf) Clayton

Pl. 175.

(= *S. flabellata* Stapf subsp. *natalensis* De Wit) 2; (= *S.*
homblei De Willd.) 2; (= *S. torta*
Stapf) 2.



Twisted leaf bristle grass.

Perennial; shortly rhizomatous and tufted (most leaves basal; culms occasionally flat and rooting at the nodes); 300–500(–1000) mm tall. Leaf blades 100–300 mm long; 1–3 mm wide (mostly folded or inrolled). Spikelets 2.5–3.0 mm long. Basal sheaths usually strongly keeled and flabellate; old leaves curly; culm nodes glabrous; panicle spike-like, 25–45 mm long; bristles 7–15 per spikelet cluster, usually dark purple-brown but occasionally yellowish; lower glume 3-nerved; lemma rugose.

Flowering September to March. On rocky outcrops, hillsides, open woods and grassland on well-drained soils.

Common (usually scattered amongst other grasses). Biome: Fynbos, Savanna, Grassland, Nama-Karoo, and Succulent Karoo. Tropical Africa. Well eaten natural pasture. Very slender and small when compared to the other varieties, representing the smallest extreme of the *S. sphacelata* complex.

Description: Stapf 1930 (801), Chippindall & Crook 1976 (92), Clayton et al. 1970–1982 (529). Voucher: Scheepers 1451, Manders 4. PRECIS code 9901280–02590.

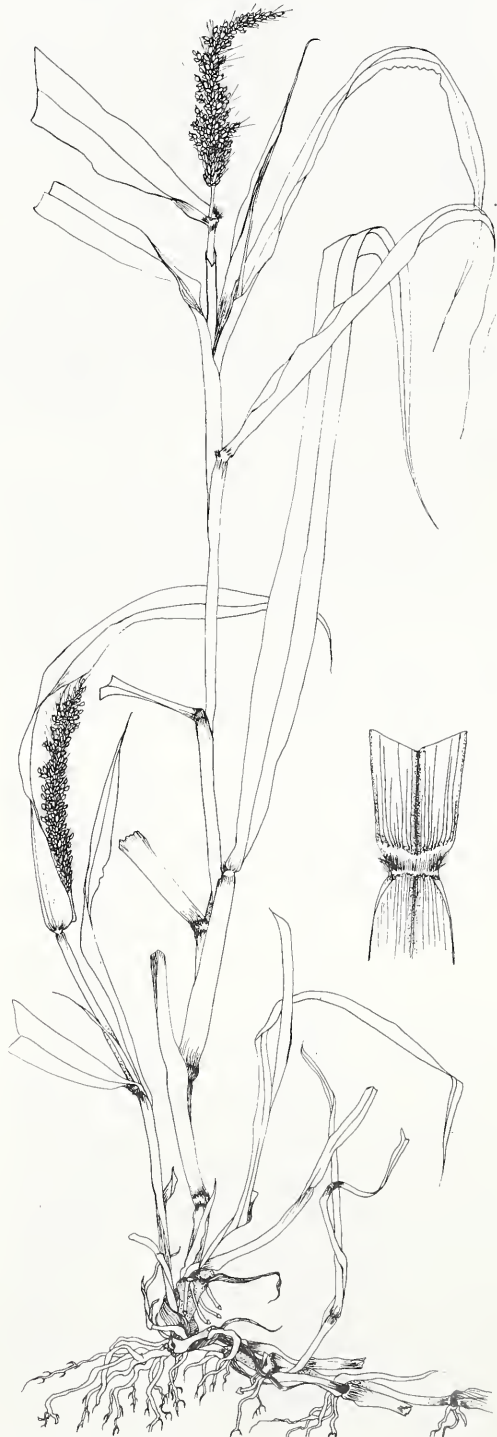


Fig. 192. *Setaria verticillata*

Setaria ustilata De Wit

Annual; loosely tufted (culms erect or geniculate); 120–650 mm tall. Leaf blades 50–170 mm long; 8–12 mm wide. Spikelets 2.3–2.7 mm long. Culm nodes glabrous; panicle spike-like, usually ovate but up to 5 times longer than wide; bristles 6–10 per spikelet; lower glume 3-nerved; lemma very coarsely rugose.



Flowering January to May. In the drier bushveld regions in the shade of trees and bushes. Infrequent. Biome: Savanna. ?Endemic. Closely related to *S. pallide-fusca*, which has a very finely rugose lemma and is a common weed in moist areas and cultivation.

Description: Chippindall 1955 (355), Clayton et al. 1970–1982 (531). Voucher: Smook 2619, Hardy, Retief & Herman 5331. PRECIS code 9901280–03100.

Setaria verticillata (L.) Beauv.

Klitssetaria, bur bristle grass.

Fig. 192. Pl. 176.

Annual; loosely tufted (often sprawling); 300–1000 mm tall. Leaf blades 50–300 mm long; 6–22 mm wide. Spikelets 1.5–2.5 mm long. Panicle spike-like, often shortly branched and interrupted in the lower part, 20–150 mm long; bristles retrorsely barbed, often entangled; lower glume 1-nerved.



Flowering December to May. Ruderal in disturbed areas, cultivation, cattle kraals and along paths, often in damp, shady places. Common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Old world tropics, introduced to the USA. Domestic use (inflorescences used in east Africa to keep rats from harvested grains. They adhere to small animals and cause much suffering. Plants are also used for weaving hats and toys), or pasture (good palatable hay and forage), or weed (troublesome in gardens and cultivation). Uniquely distinguished from our other *Setaria* species by the retrorsely barbed bristles.

Description: Launert 1970 (160:171), Stapf 1930 (823), Chippindall & Crook (84), Stapf 1898–1900 (429), Hitchcock & Chase 1950 (699), Chippindall 1955 (355), Clayton et al. 1970–1982 (522). Illustration: Clayton et al. 1970–1982 (fig. 127), Hitchcock & Chase 1950 (fig. 1566). Voucher: Dahlstrand 2485, Du Toit 174. PRECIS code 9901280–03200.

Sorghastrum Nash

Dipogon Steud., *Poranthera* Raf.

Annual, or perennial; caespitose. Culms 700–1500 mm high; herbaceous; branched above, or unbranched above. *Ligule an unfringed membrane to a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (hermaphrodite and sterile); overtly heteromorphic (in that the sterile spikelets are reduced to pedicels), or homomorphic (rarely the pedicellate spikelets are well developed and similar to the sessile ones).*

Inflorescence paniculate (narrowly elongated, more or less unilateral panicles of much-reduced, capillary 'racemes'); open (usually narrow); espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes very much reduced (the ultimate units with very few spikelets, often only one accompanied by the sterile pedicel); disarticulating at the joints (but the disarticulating units much reduced) or falling entire (when reduced to one joint).

Spikelets nearly always in pairs (but ostensibly solitary, by virtue of the 'pedicellate' member being reduced to its pedicel — by contrast with *Sorghum*); consistently in 'long-and-short' combinations (but the sterile member of each combination is nearly always reduced to its pedicel). Pedicels free of the rachis. The sessile spikelets hermaphrodite. The 'pedicellate spikelets' sterile (usually reduced to pedicels). Female-fertile spikelets 5–8 mm long; compressed dorsiventrally (plump); falling with the glumes (and the joint). Glumes two; more or less equal; awnless; very dissimilar (the lower flattened and often hairy on the back, the upper glabrous and slightly keeled above). *Lower glume 9 nerved. Proximal incomplete florets 1; epaleate; sterile.*

Female-fertile florets 1. Lemmas less firm than the glumes; incised; awned. Awns 1; median; from the sinus; geniculate; much longer than the body of the lemma. Palea present, or absent; when present conspicuous but relatively short, or very reduced. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. About 20 species. Mainly tropical and subtropical Africa and America. Helophytic to mesophytic; in shade, or in open habitats (savanna and woodland margins, often in wet places); glycophytic. Namibia, Botswana, Transvaal, and Natal. 2 indigenous species.



Fig. 193. *Sorghastrum friesii*

Sorghum bicolor (L.) Moench subsp. *arundinaceum*
(Desv.) De Wet & Harlan

(= *S. verticilliflorum* (Steud.)
Stapf) 1.

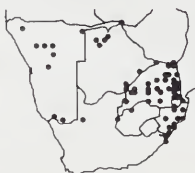
Common wild sorghum, wilde-
graansorghum.

Short-lived perennial (without
rhizomes), or annual; to 2500 mm
tall. Leaf blades 20–30 mm wide.
Spikelets (sessile) 5–7 mm long.

Disturbed places. Locally common. Biome: Savanna,
Grassland, and Nama-Karoo. Throughout tropical Africa to
Australia, introduced to tropical America.

Description: Chippindall 1955 (460). Voucher: De
Winter & Leistner 5163. PRECIS code 9900460–00300.

Pl. 178.



Sorghum bicolor (L.) Moench subsp. *drummondii*
(Steud.) De Wet

(= *S. sudanense* (Piper)
Stapf) 1.

Sudan grass, witkafferokoring,
shattercane.

Annual; to 3000 mm tall. Leaf
blades 8–15 mm wide. Spikelets
(sessile) 6–7 mm long.

Infrequent. Naturalized, native to tropical north Africa.
Pasture (planted as a fodder), or weed.

Description: Chippindall 1955 (459). Voucher: Nat.
Herb Pretoria B. PRECIS code 9900460–00350.



Sorghum halepense (L.) Pers.

(= *S. alnum* Parodi) 1.

Johnson grass.

Perennial; usually strongly
long-rhizomatous; to 2500 mm
tall. Leaf blades 10–30 mm wide.
Spikelets (sessile) 4.0–5.5(–7.0)
mm long (pedicellate spikelet
longer).

Flowering usually December to May (occasionally at
other times). In disturbed places. Common. Naturalized
from the Mediterranean region, now widely naturalized.
Biome: Fynbos, Savanna, Grassland, and Nama-Karoo.
Worldwide in warm areas. Weed (especially difficult to
eradicate because of its long, deeply buried rhizomes).

Description: Chippindall 1955 (460). Illustration:
Chippindall 1955 (fig. 377), Hitchcock & Chase 1950 (fig.
1177). Voucher: Webber 2–2–23. PRECIS code 9900460–
02600.

Fig. 194.



Sorghum versicolor Anderss.

Swartsaadgras, black wild
sorghum.

Perennial, or annual; 600–
1200 mm tall. Leaf blades 4–8
mm wide. Spikelets (sessile) 4–7
mm long. Nodes with spreading
white hairs, spikelets black at
maturity.

Flowering December to May. Black turf soil. Common.
Biome: Savanna and Grassland. Tropical Africa.

Description: Chippindall 1955 (459), Clayton et al.
1970–1982 (729). Illustration: Chippindall 1955 (pl. 14).
Voucher: De Winter 2915. PRECIS code 9900460–03700.



Spartina Schreber

Chauvinia Steud., *Limnetis* Rich., *Poncelletia* Thours,
Psammophila Schult., *Solenachne* Steud., *Trachynotia*
Michaux, *Tristania* Poir.

Perennial; long-rhizomatous to long-stoloniferous, or
caespitose. Culms 200–3000 mm high; herbaceous. Leaf
blades flat, or rolled. *Ligule a fringe of hairs.*



Fig. 195. *Spartina maritima*

Inflorescence of spike-like main branches (with 2 to many long or short spikes, borne racemously on the main axis); axes not ending in spikelets (their slender, naked tips often prolonged); espatheate. Spikelet-bearing axes persistent.

Spikelets biseriate; 6–18 mm long; compressed laterally; falling with the glumes. Glumes two; very unequal (the upper longer); long relative to the adjacent lemmas (i.e., the upper, which often exceeds the lemma); awned (shortly), or awnless; similar (coriaceous or membranous). All florets female-fertile; *proximal incomplete florets absent*.

Female-fertile florets 1. Lemmas 1–3 nerved; entire, or incised; awnless. Palea present; relatively long. Stamens 3 (the anthers relatively long). Ovary glabrous. Fruit medium sized; fusiform; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C₄; PCK (*anglica*); XyMS+. PCR sheath outlines uneven. PCR sheath extensions present. Maximum number of extension cells 7–8. PCR cell chloroplasts with well developed grana; centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 7$ and 10. Chloridoideae; Chlorideae *sensu lato*. 16 species. Temperate America, coastal Europe, Africa, Tristan da Cunha. Commonly adventive. Hydrophytic to helophytic; in open habitats; halophytic. Namibia and Cape Province. 1 indigenous species.

References. 1. Launert. 1970. FSWA.

Species treatment by M. Koekemoer.

***Spartina maritima* (Curtis) Fernald**

(=*S. capensis* Nees ex Trin.) 1.

Cape cord grass, strandkweek.

Perennial; hydrophyte and rhizomatous, or stoloniferous; 200–800 mm tall. Leaf blades 120–190 mm long. Spikelets 12–15 mm long. Leaf blades inrolled; spikes robust, one-sided, usually 2–3 (rarely 1), not spreading.

Flowering November to April. Along coasts on intertidal mud flats, around estuaries or submerged in lagoons. Locally common. Biome: Fynbos and Succulent Karoo. Atlantic coastlines. Hybridization, back-crossing and polyploidy complicate taxonomy in this genus, which has 16 species worldwide but only one representative here.

Description: Chippindall 1955 (208). Illustration: Chippindall 1955 (fig. 185). Voucher: Boucher 2999. PRECIS code 9902930–00200.

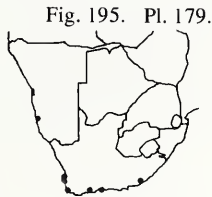


Fig. 195. Pl. 179.

***Sphenopus* Trin.**

Annual; caespitose. Culms 70–300 mm high; herbaceous. Leaf blades linear; flat (to almost filiform). *Ligule* an *unfringed membrane*.

Inflorescence paniculate; open; with *conspicuously divaricate branchlets* (spikelets numerous and very small); espatheate. Spikelet-bearing axes persistent.

Spikelets 1.5–2.5 mm long; compressed laterally; disarticulating above the glumes. Glumes two; minute to relatively large (G2 0.5–0.9 mm long in *S. divaricatus*); very unequal; markedly shorter than the spikelets; awnless; similar (hyaline, rounded to emarginate). *Lower glume 0 nerved*. All florets female-fertile; *proximal incomplete florets absent*.

Female-fertile florets 2–7. Lemmas decidedly firmer than the glumes; 3 nerved; entire; awnless; non-carinate (but keeled on all three veins). Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 3.

Ovary glabrous. Fruit small; hilum short.

Cytology, classification, distribution. Chromosome base number, $x = 6$ and 7. Pooideae; Poodae; Poeae. 2 species. Mediterranean to western Asia. In open habitats; maritime-arenicolous and halophytic. Cape Province. 1 naturalized species.

References. 1. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.



Fig. 196. *Sphenopus divaricatus*

Sphenopus divaricatus (Gouan) Reichb.

(=*Poa divaricata* Gouan) 1.

Fig. 196. Pl. 180.



Annual; tufted (slender, outer stems geniculate and spreading from the base); 70–200(–300) mm tall. Leaf blades 30–70 mm long; setaceous or rolled, to 1 mm wide. Spikelets 2–3 mm long. Ligule membranous, to 4 mm long; panicle open, delicate, with multiple branching; spikelets 2–5-flowered, pedicellate, pedicels 1.5–7.0 mm long; glumes unequal, lower scale-like, upper to 1 mm long; lemmas 1.25–1.50 mm long, obtuse or rounded.

Flowering August to October. Coastal areas on mudflats along rivers or salty marshes or in hollows between dunes. Rare. Locally common. Naturalized from Europe. Biome: Fynbos and Succulent Karoo. Southwestern Europe, Mediterranean region eastwards to central Asia, introduced to South Africa and Australia.

Description: Bor 1985 (1740), Linder (59). Voucher: Smook 3650. PRECIS code 9903790–00100.

Sporobolus R.Br.

Agrosticula Raddi, *Bauea* Fourn., *Cryptostachys* Steud., *Diachyrium* Griseb., *Spermachiton* Llanos, *Triachyrum* A. Br.

Annual (rarely), or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 50–1600(–3000) mm high; herbaceous. Leaf blades linear; flat, or folded, or rolled. *Ligule a fringed membrane (narrow), or a fringe of hairs.*

Inflorescence a false spike, with clusters of spikelets on reduced axes, or a single raceme (rarely), or paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets 0.8–3.5 mm long (rarely, to 6 mm); compressed laterally to not noticeably compressed (often fusiform); disarticulating above the glumes. Hairy callus absent. Glumes two; very unequal (G1 often very short), or more or less equal; decidedly shorter than the adjacent lemmas, or long relative to the adjacent lemmas; awnless; persistent or subpersistent, thinly membranous or hyaline. *Lower glume 1 nerved.* All florets female-fertile, or rarely distal incomplete florets also present; *proximal incomplete florets absent.*

Female-fertile florets 1. Lemmas 1 nerved, or 2 nerved; entire; awnless. Palea present; relatively long. Lodicules when present 2; fleshy; glabrous. Stamens 2–3. Ovary glabrous. Fruit small (0.3–2 mm); hilum short; pericarp free (commonly swelling when wet, forcibly ejecting the seed); embryo large.

Photosynthetic pathway and related features. C₄; PCK (6 species), or NAD–ME (4 species); XyMS+. PCR sheath outlines uneven, or even. PCR sheath extensions present, or absent. Maximum number of extension cells when present 2–5. PCR cell chloroplasts ovoid, or elongated; with well developed grana; centrifugal/peripheral, or centripetal.

Cytology, classification, distribution. Chromosome base number, *x* = 9 and 10. Chloridoideae; Chlorideae *sensu lato*. 160 species. Tropical and warm temperate. Mesophytic, or xerophytic; in diverse habitats; maritime-arenicolous, or halophytic, or glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 39 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton et al. 1974 FTEA. 3. De Winter & Vorster. 1974. Bothalia 11: 295. 4. Goossens. 1938. Trans. Roy. Soc. S.A. 26: 173.

Species treatment by M. Koekemoer.

- 1(0). Panicle with primary branches in whorls, or with at least the lowermost branches in a single whorl . 2
Panicle with primary branches not whorled 15
2(1). Plants less than 180 mm tall at maturity; leaf blades 10–30 mm long, 1–5 mm wide, forming a basal rosette, the margins with stiff spreading hairs; culms 1-noded; spikelets pendulous at maturity, grains discoid **S. discosporus**
Plants not as above 3



Fig. 197. *Sporobolus africanus*

- 3(2). Plants annual 4
Plants perennial 6
- 4(3). Spikelets longer than 2 mm, fewer than 4 per primary branch; grains 1.2–1.9 mm in diameter; inflorescence lacking viscid patches on the central axis and primary branches *S. panicoides*
Spikelets shorter than 2 mm, more than 4 per primary branch; grains less than 1 mm in diameter; inflorescence with viscid patches on the central axis and primary branches 5
- 5(4). Lower glume linear, more than 0.5 mm long and at least half the length of the spikelet; viscid patches rounded to ovate *S. stolzii*
Lower glume obovate, shorter than 0.5 mm, reduced to a tiny scale, or absent; viscid patches more than 3 times longer than wide *S. coromandelianus*
- 6(3). Spikelets shorter than 1.5 mm; upper glume prominently keeled, keel scabrid, central nerve lighter in colour than the rest of the glume; primary branches with spikelets in the upper half *S. nitens*
Spikelets longer than 1.5 mm; upper glume rounded, central nerve not distinctly coloured; primary branches with spikelets over the whole length or only in the upper part 7
- 7(6). Leaf blades rounded at the base; upper glume 2/3–3/4 the spikelet length; lower glume 1/4 the spikelet length *S. kentrophyllus*
Leaf blades tapering at the base; upper glume as long as or slightly longer than the spikelet; lower glume 1/4 to as long as the spikelet 8
- 8(7). Lower glume longer than 2/3 the spikelet length; leaf blades inrolled; upper glume longer than the spikelet *S. centrifugus*
Lower glume shorter than 2/3 the spikelet length; leaf blades flat or sometimes inrolled; upper glume as long or longer than the spikelet 9
- 9(8). Leaf blade margins with flexuous hairs longer than 0.5 mm 10
Leaf blade margins glabrous or with scabrid hooks less than 0.5 mm long 12
- 10(9). Spikelets very densely clustered on the upper 1/3 of the primary branches; upper glume as long as spikelet; lower glume 1/2 the spikelet length *S. pectinatus*
Spikelets not clustered, covering the whole length or only the upper half of the branches, overlapping not more than half the spikelet length; upper glume longer than spikelet; lower glume 1/2–3/4 the spikelet length 11
- 11(10). Panicle pyramidal, 100–200 mm long, with fewer than 10 whorls; lower glume 1.7–4.0 mm long, 1/2–3/4 the spikelet length *S. congoensis*
Panicle linear to lanceolate, 200–430 mm long, with more than 10 whorls; lower glume 0.5–1.6 mm long, shorter than 1/2 the spikelet length *S. sanguineus*
- 12(9). Leaf blades rigid, shorter than 30 mm; rhizomes with very short internodes, creeping horizontally and branching profusely; plants mat-forming *S. ludwigii*
Leaf blades not rigid, longer than 30 mm, rhizome not horizontally creeping or profusely branched; plants rhizomatous or tufted 13
- 13(12). Spikelets 2.5–5.0 mm long; lower glume 2/3–3/4 the spikelet length; panicle contracted *S. mauritanicus*
Spikelets 1.5–2.7 mm long; lower glume 1/4–1/3 the spikelet length; panicle open 14
- 14(13). Basal leaf sheaths yellow, hard, glossy and brittle; culms erect; plants seldom stoloniferous; leaf blades less than 3 mm wide, often inrolled, 30–140 mm long *S. rangei*
Basal leaf sheaths dull and papery; culms geniculate; plants almost always stoloniferous; leaf blades flat, more than 5 mm wide, 20–300 mm long *S. ioclados*
- 15(1). Panicle branches not dichotomous; spikelets borne on short pedicels along the length of the branchlets 16
Panicle branches dichotomous; spikelets solitary at the tips the of branchlets 31
- 16(15). Panicle narrow and spike-like 17
Panicle linear to open, not spike-like 21
- 17(16). Upper glume as long as, or slightly longer than the spikelet; lower glume 3/4 the spikelet length *S. virginicus*
Upper glume to 2/3 the spikelet length; lower glume less than 1/2 the spikelet length 18
- 18(17). Spikelets very densely clustered so that central axis is not visible; primary branches shorter than 3 mm; panicle to 5 mm wide *S. spicatus*
Spikelets not clustered to hide the central axis; primary branches to 30 mm long; panicle wider than 5 mm 18
- 19(18). Leaf blades longer than 200 mm; upper glume 1/2 the spikelet length; spikelets very dense *S. africanus*
Leaf blades shorter than 200 mm; upper glume about as long as the spikelet; spikelets somewhat loose 20
- 20(19). Plants 200–360 mm tall; spikelets 2.2–2.5 mm long; glumes and lemmas membranous *S. albicans*
Plants 500–800 mm tall; spikelets 2.5–3.0 mm long; glumes and lemmas cartilaginous *S. bechuanicus*
- 21(16). Panicle pyramidal or ovate, open, not more than three times longer than wide 22
Panicle linear, open or contracted, more than five times longer than wide (in *S. fourcadii* sometimes ovate) 23
- 22(21). Glumes keeled along the whole length or only at the tips, keel scabrid; rhizome long and deeply buried; leaves rigid *S. sp.* (=Smook 3429)
Glumes not keeled; rhizome creeping near ground level, internodes short; leaves fine and curly *S. nervosus*
- 23(21). Lemma notably long and fine, to 1.5 times the length of the spikelet; plants annual *S. molleri*
Lemma as long as the spikelet; plants perennial 24
- 24(23). Upper and lower glumes more or less equal and as long as the spikelet; glumes keeled, keel scabrid; plants reed-like *S. consimilis*
Upper glume half to as long as spikelet and lower glume less than 1/2 the spikelet length; glumes not keeled; plants not reed-like 25
- 25(24). Glumes subequal, both glumes less than 1/3 the spikelet length *S. pyramidalis*
Glumes unequal, upper glume 1/2 to slightly longer than the spikelet; lower glume shorter than the spikelet 26
- 26(25). Old leaf sheaths splitting into fibres with age; leaves setaceous, relatively short and forming a cushion at the base *S. pellucidus*
Old leaf sheaths not splitting into fibres; leaves not setaceous or forming a cushion at the base 27
- 27(26). Culms more than 3 mm in diameter (100 mm above base); panicle 350–750 mm long, much branched, branches lax; upper glume almost as long as the spikelet *S. macranthelus*
Culms less than 3 mm in diameter (100 mm above base); panicle shorter than 500 mm, branches usually firm; upper glume less than 3/4 the spikelet length 28
- 28(27). Spikelets very densely clustered on relatively short primary branches; branches rigid and contracted; panicle almost spike-like; grains ellipsoid, 1.1–1.2 mm long *S. africanus*
Spikelets not clustered; branches lax and spreading; panicle linear to pyramidal; grains to 1 mm long 29

- 29(28). Plants usually small, 250–400(–700) mm tall; panicles with a few branches far apart, branches almost horizontally spreading at maturity; upper glume 2/3 and lower glume 1/3 the spikelet length *S. fourcadii*
Plants usually taller than 1000 mm, often robust; panicle fairly dense with numerous racemes; racemes never spreading more than 60 degrees from the main axis at maturity; glume length very variable, upper glume 1/2–3/4 and lower glume 1/4–3/4 the spikelet length 30
- 30(29). Plants with characteristic oblique rhizomes; lower leaf sheaths herbaceous; upper glume about 2/3 the spikelet length *S. fimbriatus*
Plants lacking obvious rhizomes; lower leaf sheaths papery; upper glume about 1/2 the spikelet length *S. natalensis*
- 31(15). Panicle with long stiff hyaline hairs in all or some of the axils (2–15 hairs per axil) 32
Panicle lacking hairs in the axils 34
- 32(31). Panicle with very few hairs occurring in some axils; glumes unequal, upper glume 2/3 and lower glume 1/2 the spikelet length ... *S. welwitschii*
Panicle with many hairs in almost all the axils; glumes more or less equal and 1/2 the spikelet length 33
- 33(32). Rachilla extension present; plants not fibrous at the base *S. subtilis*
Rachilla extension absent; plant base fibrous *S. conrathii*
- 34(31). Spikelets 2.0–2.9 mm long *S. salsus*
Spikelets shorter than 2 mm 35
- 35(34). Basal leaf sheaths splitting into fibres at maturity 36
Basal leaf sheaths not splitting into fibres 37
- 36(35). Fibrous remains of leaf sheaths with a dense mass of woolly hairs between the fibres *S. stapfianus*
Fibrous remains of leaf sheaths lacking woolly hairs between the fibres *S. festivus*
- 37(35). Plants annual; leaf blades to 4 mm wide *S. engleri*
Plants perennial; leaf blades setaceous or to 3 mm wide 38
- 38(37). Leaf blades setaceous, rigid and forming a very dense tuft; old dead leaves and sheaths are persistent and form a dense cushion below the new growth *S. nebulosus*
Leaf blades flat; plants not tufted, with a much-branched creeping rhizome 39
- 39(38). Leaf blades shorter than 35 mm, rounded at the tips; culms mostly 1-noded; leaves mostly basal with cauline leaves much shorter than the basal ones *S. tenellus*
Leaf blades 40–120 mm long, tapering to a fine point; culms 2–5-noded; leaves basal and cauline with cauline leaves usually much longer than the basal ones *S. acinifolius*

Sporobolus acinifolius Stapf

Kalkgras, limestone dropseed.

Mat-forming perennial; rhizomatous (rhizome long and much branched); 150–430 mm tall. Leaf blades 40–120 mm long; to 3 mm wide. Spikelets 1–2 mm long. Culine leaves usually much longer than the basal leaves, leaf tips tapering to a fine point; panicle dichotomously branched, axils without hairs; spikelets solitary on branchlet tips.



Flowering February to May. Brackish calcareous soil on pans or at the edge of water. Locally common. Biome: Fynbos, Savanna, and Nama-Karoo. ?Endemic. Very similar to *S. tenellus*, which has leaf blades shorter than 35 mm and leaf tips rounded, and *S. salsus*, which has larger spikelets.

Description: Goossens 1938 (191), Stapf 1898–1900 (581), Chippindall 1955 (214). Illustration: Chippindall 1955 (fig. 189). Voucher: Smith 195. PRECIS code 9902830–00100.

Sporobolus africanus (Poir.) Robyns & Tournay

(= *S. capensis* (Willd.) Kunth) 2.

Dropseed, taaipol.

Perennial; rhizomatous and tufted; 280–1500 mm tall. Leaf blades 200–400 mm long; 1–4 mm wide. Spikelets 2.0–2.8 mm long. Panicle dense, not whorled, almost spike-like, branches relatively short and rigid, central axis usually visible; lower glume 1/4–1/2 the spikelet length; upper glume 1/2 the spikelet length; grain ellipsoid, 1.1–1.2 mm long.

Flowering October to April. Mainly in disturbed places and along streams. Common. Biome: Fynbos, Savanna, and Grassland. Northwards through tropical east Africa to Ethiopia. Traditional medicine (local application to wounds and snake bite). The typical form can be distinguished from *S. fourcadii*, *S. fimbriatus*, *S. pyramidalis* and *S. natalensis*, by its contracted, almost spike-like panicle with short firm branches and longer grains. *S. africanus*, *S. fimbriatus*, *S. natalensis* and *S. pyramidalis* form an interlaced group of species, in which the typical forms are overshadowed by a large number of intermediates, for which Clayton (1974) suggests a hybrid origin. Further research is needed to distinguish these specimens satisfactorily.

Description: Goossens 1938 (213), Launert 1970 (160:181), Chippindall 1955 (225), Clayton et al. 1970–1982 (375). Illustration: Chippindall 1955 (fig. 198). Voucher: Smook 5456, Pole Evans 139. PRECIS code 9902830–00200.

Sporobolus albicans Nees

Mat-forming perennial; rhizomatous; 200–360 mm tall. Leaf blades 5–12 mm long; 1 mm wide. Spikelets 2.0–2.5 mm long. Inflorescence 25–30 mm wide, spike-like but spikelets not densely clustered to hide the central axis; glumes and lemmas membranous, pale yellow.

Flowering February to April. Limestone pans or dried up depressions. Locally common. Biome: Grassland and Nama-Karoo. Endemic. Very similar to *S. virginicus*, which has longer glumes, and *S. bechuanicus*, which has longer spikelets and cartilaginous lemmas.

Description: Goossens 1938 (194), Launert 1970 (160:181), Stapf 1898–1900 (580), Chippindall 1955 (214). Voucher: Smook & Gibbs Russell 2439. PRECIS code 9902830–00300.

Sporobolus bechuanicus Goossens

Perennial; tufted; 500–800 mm tall. Leaf blades 120–200 mm long; 3.0–3.5 mm wide. Spikelets 2.5–3.0 mm long. Panicle spike-like, more than 5 mm wide; spikelets not hiding the central axis; glumes and lemmas cartilaginous.

Flowering January to April.



Brackish soil on seasonally flooded pans. Rare. Biome: Savanna. ?Endemic. Very similar to *S. albicans*, which has smaller spikelets and membranous lemmas, and to *S. virginicus*, which has longer glumes.

Description: Goossens 1938 (210), Chippindall 1955 (226). Voucher: Pole Evans 3277. PRECIS code 9902830-00500.

***Sporobolus centrifugus* (Trin.) Nees**

(=*S. schlechteri* Schweick.) 2.

Olive dropseed.

Perennial; rhizomatous (rhizome can be long and creeping); 180–900(–1060) mm tall. Leaf blades 60–300 mm long, filiform; 1.0–1.5 mm wide. Spikelets 2.5–4.2 mm long. Basal sheaths hard, brittle, glossy, yellow or brown; panicle contracted and unobtrusively whorled; spikelets in lowest whorl often sterile and disarticulating at maturity; lower glume slightly shorter than spikelet; upper glume longer than spikelet.

Flowering October to April. High mountainveld or highveld on humiferous well-drained soils. Locally common. Biome: Savanna, Grassland, and Afromontane. Tropical east Africa. Similar to *S. mauritanicus*, *S. sanguineus* and *S. congoensis*, which have shorter glumes, and female-fertile spikelets in the lowest whorl.

Description: Goossens 1938 (182), Stapf 1898–1900 (584), Chippindall 1955 (220), Clayton et al. 1970–1982 (365). Voucher: Wedermann & Oberdieck 2188, Davidse 6790. PRECIS code 9902830-00600.

***Sporobolus congoensis* Franch.**

(=*S. eylesii* Stent & Rattray) 2.

Perennial; rhizomatous; 380–920 mm tall. Leaf blades 60–220 mm long; 3–10 mm wide. Spikelets 3.0–4.5 mm long. Leaf blades ciliate on the margins; panicle 100–200 mm long, whorled, with fewer than 10 whorls; spikelets loosely clustered on the upper two thirds of the branches; lower glume 1.7–4.0 mm long, 1/2–3/4 the spikelet length; upper glume longer than spikelet.

Flowering November to January. Shallow rocky soil on sandstone and quartzite. Infrequent. Biome: Grassland. Tropical east Africa. Similar to *S. sanguineus*, which has a larger panicle with more than 10 whorls and shorter lower glumes, *S. mauritanicus*, with glabrous or scabrid leaf blade margins, and to *S. centrifugus*, which has a longer lower glume and sterile spikelets in the lowest whorl.

Description: Chippindall & Crook 1976 (114), Chippindall 1955 (222), Clayton et al. 1970–1982 (365). Voucher: Acocks & Hafstrom 54. PRECIS code 9902830-00650.

***Sporobolus conrathii* Chiov.**

Perennial; tufted; 200–480 mm tall. Leaf blades 100–180 mm long; 1.0–1.5 mm wide. Spikelets 1.5–1.9 mm long. Plant base fibrous; panicle dichotomously branched with stiff long hairs in the axils; glumes about equal, 1/3–1/2 the spikelet length.

Flowering December to March. Shallow soil on rocky slopes or outcrops. Locally common. Biome: Savanna and Grassland. Endemic. Similar to *S. welwitschii*, which has a panicle with very few hairs in some of the axils, unequal glumes and a longer upper

glume, and to *S. subtilis*, which has a rachilla extension and lacks a fibrous base.

Description: Goossens 1938 (188), Chippindall 1955 (212). Voucher: Du Toit 80. PRECIS code 9902830-00700.

Fig. 198. Pl. 181.



Fig. 198. *Sporobolus centrifugus*

***Sporobolus consimilis* Fresen.**

(=*S. robustus* sensu Chippind., non Kunth) 2.

Vleigras.

Robust and reed-like perennial; rhizomatous; 880–1600 mm tall. Leaf blades 300–600 mm long; 6–10 mm wide. Spikelets 1.7–2.5 mm long. Panicle not whorled, linear, more than five times longer than wide; lower and upper glumes more or less as long as the spikelet; glumes keeled, keel scabrid.

Flowering November to May. On sand or turf soils in river beds, on sand banks and near brackish springs. Common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical Africa to Somalia and Chad. Distinguished from other species which have linear panicles with non-whorled branches by its reed-like appearance and glumes that are keeled and about the length of the spikelet.

Description: Launert 1970 (160:182), Chippindall 1955 (225), Clayton et al. 1970–1982 (371). Voucher: De Winter & Leistner 5804. PRECIS code 9902830–00800.

***Sporobolus coromandelianus* (Retz.) Kunth**

(=*S. argutus* (Nees) Kunth) 2; (=*S. pyramidatus* sensu Chippind., non (Lam.) Hitchc.) 2.

Small dropseed.

Annual; tufted; 100–340 mm tall. Leaf blades 20–100 mm long; 2–4 mm wide. Spikelets 1.0–1.5 mm long. Panicle with lowest branches in a single whorl; central axis and branches with viscid patches more than three times longer than wide; lower glume oblong, 0.1–0.5 mm long, less than 1/3 the spikelet length; upper glume as long as spikelet.

Flowering February to April. In or near brackish pans, usually on fine clayey soil. Locally common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical Africa to India. Similar to *S. nitens* and *S. ludwigii*, which are perennial. Some specimens of *S. coromandelianus* have previously been wrongly identified as *Sporobolus cordofanus* (Steud.) Coss. and *S. uniglumis* Stent & Rattray.

Description: Launert 1970 (160:182), Chippindall 1955 (220), Clayton et al. 1970–1982 (363). Voucher: Giess & Loutit 14146. PRECIS code 9902830–00900.

***Sporobolus discosporus* Nees**

Oortjesgras, disc dropseed.

Perennial, or annual; shortly rhizomatous, or tufted; 55–180 mm tall. Leaf blades 10–30 mm long; 2–5 mm wide. Spikelets 1.0–1.7 mm long. Leaf blades short and broad, in a basal rosette, margins pectinately ciliate; panicle whorled; spikelets pendulous at maturity; grains discoid.

Flowering November to May. Sandy depressions on Cave sandstone or other exposed bedrock; often on clayey soil in bare patches or wet areas. Locally common. Biome: Grassland, and Nama-Karoo. East Africa to Ethiopia. Easily distinguished by its small size, short, wide, pectinately ciliate leaf blades, pendulous spikelets and discoid grains.

Description: Goossens 1938 (218), Stapf 1898–1900 (582), Chippindall 1955 (219), Clayton et al. 1970–1982 (358). Illustration: Chippindall 1955 (fig. 194). Voucher: Smook & Gibbs Russell 2341. PRECIS code 9902830–01000.

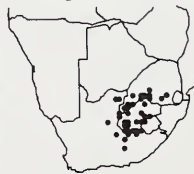


Fig. 199. Pl. 182.

***Sporobolus engleri* Pilg.**

Annual; tufted; 120–600 mm tall. Leaf blades 40–150 mm long; 2–5 mm wide. Spikelets 1.0–1.5 mm long. Leaf blades flat; culms 1–2 mm in diameter; panicle dichotomously branched, without hairs in the axils; spikelets solitary at the branchlet tips.

Flowering March to May.

Deep sand on dunes and in dry riverbeds, also on rocky soil and often in shady places. Locally common. Biome: Savanna, Nama-Karoo, and Desert. Endemic. Very closely related to *S. nebulosus*, which is perennial and has setaceous leaf blades, also similar to *S. festivus* and *S. stapfianus*, which have the fibrous remains of old leaf sheaths at the base.

Description: Launert 1970 (160:182). Voucher: Van Vuuren & Giess 1167. PRECIS code 9902830–01100.

***Sporobolus festivus* A. Rich.**

(=*S. festivus* A. Rich. var. *fibrosus* Stent) 2.

Rooigras.

Perennial; tufted; 100–550 mm tall. Leaf blades 20–70 mm long; 1–2 mm wide. Spikelets 0.8–1.5 mm long. Old leaf sheaths splitting into fibres, lacking woolly hairs between them; panicle dichotomously branched without hairs in the axils.

Flowering December to May. On exposed bedrock in sandfilled depressions, also in vleis, on pans edges and in mopane woodland. Locally common to common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical east Africa to Mauritania and Somalia. Pasture (food for warthog). Similar to *S. stapfianus*, which has dense woolly hairs between the basal fibres, *S. engleri*, which is annual, and *S. nebulosus*, which lacks fibres at the base.



Fig. 199. *Sporobolus discosporus*

Description: Goossens 1938 (195), Chippindall & Crook 1976 (113), Launert 1970 (160:183), Stapf 1898–1900 (582), Chippindall 1955 (213), Clayton et al. 1970–1982 (384). Voucher: Story 6236. PRECIS code 9902830–01300.

Sporobolus fimbriatus (Trin.) Nees

(= *S. fimbriatus* (Trin.) Nees
var. *latifolius* Stent) 2.

Pl. 183.



Blousaadgras, dropseed.

Perennial; densely tufted and rhizomatous (rhizome characteristically oblique); 240–1600 mm tall. Leaf blades to 300 mm long; 2–4 mm wide. Spikelets 1.4–2.2 mm long. Panicle fairly dense, open, branches numerous, not whorled and not spreading more than 60 degrees; lower glume 1/4–3/4 the spikelet length; upper glume about 2/3 the spikelet length.

Flowering December to May. Sandy well-drained loam near water, often in disturbed areas or in shady spots. Common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Tropical east Africa to Sudan and Somali. Food and drink (seeds pulverised for porridge in times of famine), or chemicals (hydrocyanic acid in wilted plants). See the comment as *S. africanus*. Two varieties have previously been recognized on leaf width, but this distinction is not clear and the varieties therefore are not upheld.

Description: Goossens 1938 (205), Launert 1970 (160:183), Stapf 1898–1900 (585), Chippindall 1955 (224), Clayton et al. 1970–1982 (377). Illustration: Chippindall 1955 (fig. 197), Clayton et al. 1970–1982 (fig. 101). Voucher: Smook 2779. PRECIS code 9902830–01400.

Sporobolus fourcadii Stent

Perennial; rhizomatous and tufted; 250–400(–700) mm tall. Leaf blades 80–350 mm long; 4–7 mm wide. Spikelets 2.0–2.6 mm long. Panicle much longer than wide, branches not whorled, spreading almost horizontally at maturity; lower glume 1/3, upper glume 2/3 the spikelet length.



Flowering November to March. On the edge of floodplains or on forest margins. Locally common. Biome: Savanna. Possibly endemic. Distinguished from *S. fimbriatus*, *S. pyramidalis*, *S. natalensis* and *S. africanus* by the key characters.

Description: Goossens 1938 (191), Stent 1927 Bothalia 2 (269), Chippindall 1955 (223). Voucher: Giffen 658. PRECIS code 9902830–01600.

Sporobolus ioclados (Trin.) Nees

(= *S. ioclados* (Trin.) Nees
var. *usitatus* (Stent) Chippind.)
2; (= *S. marginatus* Hochst. ex
A. Rich.) 2; (= *S. smutsii* Stent)
2; (= *S. usitatus* Stent) 2.



Pan dropseed.

Perennial (often mat-forming); rhizomatous and stoloniferous; 250–1000 mm tall. Leaf blades 20–300 mm long; 2–12 mm wide. Spikelets 1.5–2.5 mm long. Basal leaf sheaths papery; culms geniculate; leaf blades flat; panicle whorled; lower glume 1/4–1/3 the spikelet length; upper glume as long as, or longer than the spikelet.

Flowering January to April. A variety of soil types, including black turf and sand, often in disturbed places. Common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical Africa to India. Well eaten natural pasture. Panicle

similar to *S. ludwigii*, which is mat-forming, has a horizontally creeping rhizome and shorter leaf blades, also similar to *S. rangei*, which has shorter and narrower leaf blades and is seldom stoloniferous.

Description: Chippindall & Crook 1976 (115), Goossens 1938 (198), Launert 1970 (160:183), Stapf 1898–1900 (583), Chippindall 1955 (216), Clayton et al. 1970–1982 (367). Illustration: Chippindall 1955 (fig. 192). Voucher: De Winter & Codd 340. PRECIS code 9902830–01700.

Sporobolus kentrophyllus (K. Schum.) Clayton

Tussocky perennial; rhizomatous and stoloniferous; 130–950 mm tall. Leaf blades 30–180 mm long; 4–8 mm wide. Spikelets 1.5–2.5 mm long. Leaf blades rounded at the base; panicle partly whorled (at least the lowest branches); lower glume 1/4 the spikelet length; upper glume 2/3–3/4 the spikelet length.



Flowering January to March. Powdery loam or calcareous soil on lake beds, also in moist depressions on old lands. Rare. Biome: Savanna. Tropical east Africa to Somalia. The two specimens recorded for our area do not match the type specimen of *S. verdcourtii* (a synonym) satisfactorily although they match other cited specimens from east Africa.

Description: Clayton et al. 1970–1982 (369). Voucher: Killick & Leistner 3422. PRECIS code 9902830–01800.

Sporobolus ludwigii Hochst.

Brakvleigras.

Mat-forming perennial; rhizomatous (rhizome long, creeping and profusely branched); 100–450 mm tall. Leaf blades 10–30 mm long; 2–3 mm wide. Spikelets 1.5–2.0 mm long. Leaf blade margins not ciliate; panicle whorled; lower glume 1/3 the spikelet length; upper glume as long as the spikelet.



Flowering January to May. Fine, damp calcareous soils in vleis or near pans. Locally common. Biome: Savanna and Grassland. Possibly endemic. Superficially similar to *S. nitens*, which has smaller spikelets, *S. coromandelianus*, which is annual, and *S. ioclados*, which has longer leaf blades and is usually stoloniferous.

Description: Goossens 1938 (201), Stapf 1898–1900 (583), Chippindall 1955 (216). Illustration: Chippindall 1955 (fig. 191). Voucher: Esterhuysen 2018. PRECIS code 9902830–02000.

Sporobolus macranthelus Chiov.

Robust perennial; rhizomatous; 1050–1700 mm tall. Leaf blades to 450 mm long; 4–7 mm wide. Spikelets 1.6–2.4 mm long. Culms 3–7 mm in diameter; panicle lax, much branched, linear and not whorled, 350–750 mm long.



Flowering January to February. Often in the shade of riverine woodland or on the edge of floodplains on fertile loam. Rare. Biome: Savanna. Tropical east Africa to Sudan and Somalia. Distinguished from *S. africanus*, *S. fourcadii*, *S. fimbriatus* and *S. natalensis* by its robust habit and large panicle.

Description: Clayton et al. 1970–1982 (380). Voucher: Smith 803. PRECIS code 9902830–02050.

Sporobolus mauritianus (Steud.) Dur. & Schinz

(= *S. artus* Stent) 2.

Perennial; densely tufted and rhizomatous; 170–430 mm tall. Leaf blades 50–250 mm long; 1–6 mm wide (often filiform). Spikelets 2.5–5.0 mm long. Basal sheaths papery, not glossy; panicle with lowest branches whorled, primary branches short and contracted; lower glume $2/3$ – $3/4$ the spikelet length; upper glume longer than the spikelet.

Flowering October to January. Poorly drained soil in marshy areas or on coastal sandflats, fairly frequent in sourveld. Infrequent. Biome: Savanna and Grassland. Tropical Africa, Madagascar and Mauritius. Similar to *S. congoensis* and *S. sanguineus*, which have flexuous hairs longer than 0.5 mm on the leaf margins, and *S. centrifugus*, which has sterile spikelets in the lowest whorl and longer lower glumes.

Description: Goossens 1938 (181), Chippindall 1955 (221), Clayton et al. 1970–1982 (366). Voucher: Schrire 613. PRECIS code 9902830–02150.

Sporobolus molleri Hack.

Annual; loosely tufted; 110–360 mm tall. Leaf blades 20–250 mm long; 1–5 mm wide. Spikelets 1.7–2.0 mm long. Panicle linear, more than five times longer than wide, not whorled; lemma narrow and needle-like, notably longer (to 1.5 times) than the rest of the spikelet.

Flowering February to April. Well-drained soil on abandoned or cultivated lands. Rare. Biome: Savanna. Tropical Africa south of the Congo River. Weed (easily controlled by cultivation). A single collection is known from near Tzaneen. The long narrow lemma of this species is unique for the genus.

Description: Chippindall & Crook 1976 (111), Clayton et al. 1970–1982 (372). Voucher: Retief 33. PRECIS code 9902830–02160.

Sporobolus natalensis (Steud.) Dur. & Schinz

Perennial; tufted; 550–1450 mm tall. Leaf blades 250–500 mm long; 2–4 mm wide. Spikelets 1.6–2.3 mm long. Panicle fairly dense, branches numerous, not whorled, contracted or sometimes spreading; lower glume $1/3$ – $1/2$ the spikelet length; upper glume $1/2$ – $2/3$ the spikelet length.

Flowering December to April. Sandy well-drained soil near water or in woodlands, often in disturbed places. Infrequent. Biome: Savanna and Grassland. Tropical east Africa to Ethiopia. See the comment at *S. africanus*.

Description: Launert 1970 (160:184), Clayton et al. 1970–1982 (374). Voucher: Liebenberg 8661. PRECIS code 9902830–02170.

Sporobolus nebulosus Hack.

Perennial; densely tufted and rhizomatous; 70–300 mm tall. Leaf blades filiform and rigid, 15–50 mm long; 0.3–1.0 mm wide. Spikelets 0.8–1.4 mm long. Old dead leaves and sheaths form a hard, dense cushion below the new growth; panicle dichotomously branched, without hairs in the axils; spikelets solitary at the branchlet tips.

Flowering January to May. In depressions or moist places in deep sand. Locally common. Biome: Savanna, Nama-Karoo, and Desert. Endemic. Closely related to *S. engleri*, which is annual, and *S. festivus* and *S. stapfianus* in which the old leaf sheaths split into fibres.

Description: Goossens 1938 (220), Launert 1970 (160:184), Chippindall 1955 (213). Illustration: Chippindall 1955 (fig. 188). Voucher: Volk 58. PRECIS code 9902830–02200.

Sporobolus nervosus Hochst.

(= *S. lampranthus* Pilg.) 2;
(= *S. sladenianus* Bol. f.) 2.

Perennial; rhizomatous (rhizomes compact with short internodes, creeping horizontally at ground level); 180–530 mm tall. Leaf blades 40–100 mm long; 1–3 mm wide. Spikelets 1.7–2.4 mm long. Leaves fine and curly; panicle not whorled, pyramidal to ovate, not more than three times longer than wide; spikelets loosely grouped at the branchlet tips; glumes not keeled, lower glume $1/2$ – $2/3$ the spikelet length, upper glume $3/4$ – $4/5$ the spikelet length.

Flowering February to May. On flats or in moist depressions in sandy red soil, limestone or shale. Locally common. Biome: Savanna and Nama-Karoo. Tropical east Africa to Arabia.

Description: Launert 1970 (160:184), Chippindall 1955 (215), Clayton et al. 1970–1982 (380). Illustration: Chippindall 1955 (fig. 190), Clayton et al. 1970–1982 (fig. 102). Voucher: De Winter & Hardy 8014. PRECIS code 9902830–02250.

Sporobolus nitens Stent

Perennial; rhizomatous and stoloniferous; 190–520 mm tall. Leaf blades 35–90 mm long; 4–8 mm wide. Spikelets 1.2–1.5 mm long. Leaf blade margins wavy and scabrid or ciliate; panicle with lowest branches whorled; spikelets clustered on upper half of primary branches; lower glume $1/2$ the spikelet length; upper glume as long as spikelet, acuminate, prominently keeled, keel scabrid.

Flowering November to April. In bare patches and in overgrazed veld, also in gardens and other disturbed places. Common. Biome: Savanna and Grassland. Possibly endemic. Superficially similar to *S. coromandelianus*, which is annual, and to *S. ludwigii*, which has larger spikelets.

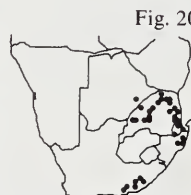
Description: Goossens 1938 (197), Chippindall 1955 (218). Illustration: Chippindall 1955 (fig. 193). Voucher: De Winter & Codd 510. PRECIS code 9902830–02300.

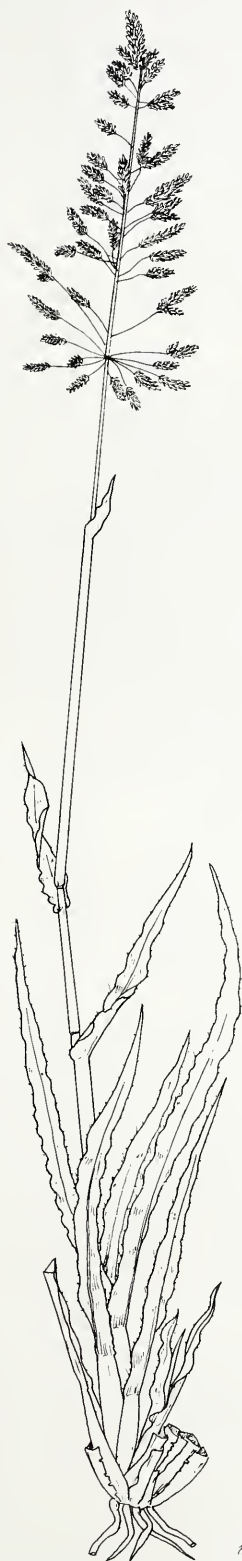
Sporobolus panicoides A. Rich.

Famine grass.

Annual; loosely tufted (erect and slender); 190–960 mm tall. Leaf blades 50–300 mm long; 2–6 mm wide. Spikelets 2.0–3.3 mm long. Inflorescence branches whorled; spikelets large, sparse, sterile in the lowest whorl; grains almost spherical, bright brown or orange coloured, 1.2–1.9 mm in diameter.

Flowering December to May. Sandy, rocky areas on steep slopes or flats, most often on roadsides or in other disturbed areas, sometimes in the shade. Locally common. Biome: Savanna. Tropical east Africa to Ethiopia. Food and drink (grains used as food in times of famine).





H. Wouda, du Toit

Fig. 200. *Sporobolus nitens*

Characterized by the few large spikelets and brightly coloured grains.

Description: Goossens 1938 (217), Chippindall & Crook 1976 (112), Launert 1970 (160:185), Chippindall 1955 (223), Clayton et al. 1970–1982 (359). Illustration: Chippindall 1955 (fig. 196), Clayton et al. 1970–1982 (fig. 100). Voucher: Fourie 2541. PRECIS code 9902830–02400.

***Sporobolus pectinatus* Hack.**

Fringed dropseed, kammetjiesgras.



Perennial; rhizomatous (older plants with long horizontally creeping rhizomes); 240–740 mm tall. Leaf blades 50–300 mm long; 5–8 mm wide. Spikelets 3.0–3.7 mm long. Leaf blades pectinately ciliate; panicle whorled; spikelets very densely clustered on the upper third of the branches, leaving the lower part bare; lower glume 1/2 the spikelet length; upper glume as long as spikelet.

Flowering November to February. Shallow rocky soil on outcrops or quartzite ridges. Infrequent. Biome: Grassland. Endemic. Characterized by the spikelet arrangement in the panicle.

Description: Goossens 1938 (186), Chippindall & Crook 1976 (114), Chippindall 1955 (221). Illustration: Chippindall 1955 (fig. 195). Voucher: Louw 3924. PRECIS code 9902830–02500.

***Sporobolus pellucidus* Hochst.**

Perennial; densely tufted and rhizomatous; 150–640 mm tall. Leaf blades 40–150 mm long; 1–2 mm wide. Spikelets 1.7–2.0 mm long. Leaf sheaths splitting into fibres with age; leaves filiform and forming a cushion at the base; panicle 60–200 mm long, not whorled, linear, more than five times longer than wide.



Flowering January to March. Calcareous soils. Rare. Biome: Savanna. Tropical east Africa to Ethiopia.

Description: Clayton et al. 1970–1982 (374). Voucher: Giess & Loutit 14102. PRECIS code 9902830–02600.

***Sporobolus pyramidalis* Beauv.**

Catstail grass, vleigras, taaipol.



Perennial; densely tufted and rhizomatous; 700–1600 mm tall. Leaf blades 100–500 mm long; 3–10 mm wide. Spikelets 1.7–2.0 mm long. Panicle linear, more than five times longer than wide; both glumes less than 1/3 the spikelet length.

Flowering November to May. Vleis, watercourses, periodically flooded areas or near dams on sandy soil or heavy clay. Common. Biome: Savanna and Grassland. Tropical Africa, Madagascar, Mauritius and Yemen. Tough and very unpalatable, erosion control (trampled areas), or indicator (of overgrazing), or weed (in pastures). See comment at *S. africanus*. Vegetatively very similar to the other 'taaipol', *Eragrostis plana*, which has several florets in each spikelet.

Description: Goossens 1938 (210), Launert 1970 (160:185), Chippindall 1955 (224), Clayton et al. 1970–1982 (373). Voucher: Smook 5043. PRECIS code 9902830–02700.

***Sporobolus rangei* Pilg.**

Perennial (usually robust); rhizomatous (rhizome usually horizontal), or stoloniferous (seldom); 350–460 mm tall. Leaf blades 30–140 mm long; setaceous or to 3 mm wide. Spikelets 1.7–2.7 mm long. Basal leaf sheaths hard, glossy and brittle; culms erect; panicle with lowest branches whorled; lower glume less than 1/2 the spikelet length; upper glume as long as the spikelet.

Flowering November to March. Calcareous sandy soil in shallow pans or near watercourses. Infrequent. Biome: Savanna and Nama-Karoo. Tropical east Africa. Similar to *S. ioclados*, which has geniculate culms and wider and longer leaf blades.

Description: Launert 1970 (160:185), Chippindall 1955 (217), Clayton et al. 1970–1982 (368). Voucher: Merxmüller 1051. PRECIS code 9902830–02800.

***Sporobolus salsus* Mez**

Perennial; rhizomatous; 270–700 mm tall. Leaf blades 45–150 mm long; 1–4 mm wide. Spikelets 2.0–2.9 mm long. Panicle dichotomously branched, without long hairs in the axils; spikelets large and solitary at the branchlet tips.

Flowering January to September. Seasonally flooded brackish pans and near hot springs or rivers. Locally common. Biome: Savanna and Nama-Karoo. Possibly endemic. Very similar to *S. tenellus* and *S. acinifolius*, which have smaller spikelets.

Description: Feddes Rep. 1921 17 (296). Voucher: De Winter & Codd 339. PRECIS code 9902830–02900.

***Sporobolus sanguineus* Rendle**

(=*S. rhodesiensis* Stent & Rattray) 2.

Perennial; loosely tufted and rhizomatous; 600–1020 mm tall. Leaf blades 100–400 mm long; 1.5–6.0 mm wide. Spikelets 2.0–3.5 mm long. Leaf blade margins ciliate; panicle 200–430 mm long, linear to lanceolate, whorled, with more than 10 whorls; lower glume less than 1/2 the spikelet length; upper glume longer than the spikelet.

Flowering November to April. Stony hillslopes and highly hilly grasslands. Infrequent. Biome: Savanna. Tropical Africa. Similar to *S. congoensis*, which has a shorter, pyramidal panicle with fewer than 10 whorls, *S. mauritanicus*, which has glabrous or scabrid leaf blade margins, and *S. centrifugus*, which has sterile spikelets in the lowest whorl and glumes longer.

Description: Chippindall & Crook 1976 (116), Chippindall 1955 (222), Clayton et al. 1970–1982 (364). Voucher: Van der Schijff 4060. PRECIS code 9902830–03000.

***Sporobolus spicatus* (Vahl) Kunth**

Mat-forming, wiry perennial; rhizomatous and stoloniferous; 250–1000 mm tall. Leaf blades rigid and spiny-tipped, 20–300 mm long; 1–4 mm wide. Spikelets 1.4–2.8 mm long. Panicle spike-like, not whorled, less than 5 mm wide; spikelets very densely clustered around the central axis and hiding it completely.



Flowering December to June. Grassy vleis, brackish sandy soil to very saline soils on pans or in river beds. Locally common. Biome: Savanna and Succulent Karoo. Tropical east Africa and drier regions of Africa, from the Mediterranean coast to India. Very similar to *S. albicans* and *S. bechuanicus*, which have wider panicles, and *S. virginicus*, which has longer glumes and a wider panicle.

Description: Goossens 1938 (209), Launert 1970 (160:185), Chippindall 1955 (226), Clayton et al. 1970–1982 (369). Illustration: Chippindall 1955 (fig. 199 at fig. 187). Voucher: Codd & Dyer 3804. PRECIS code 9902830–03200.

***Sporobolus stapfianus* Gand.**

Fynbloussaadgras, fibrous dropseed.

Perennial; tufted; 150–550 mm tall. Leaf blades 30–150 mm long; 1–2 mm wide. Spikelets 1.4–2.1 mm long. Old leaf sheaths fibrous with a mass of woolly hairs between the fibres; panicle dichotomously branched, without long hairs in the axils.

Flowering October to March. Sandy well-drained to very compacted soils on rocky outcrops or near streams. Common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical east Africa to Nigeria and Ethiopia, also in Madagascar. Very closely related to *S. festivus*, which lacks woolly hairs between the fibres, *S. engleri*, which is annual, and *S. nebulosus*, which does not have a fibrous base.

Description: Chippindall & Crook 1976 (113), Chippindall 1955 (213), Clayton et al. 1970–1982 (384). Illustration: Chippindall 1955 (fig. 187). Voucher: Burt-Davy 2683. PRECIS code 9902830–03300.

***Sporobolus stoltzii* Mez**

Annual; tufted (erect); 290–950 mm tall. Leaf blades 10–60 mm long; 2–6 mm wide. Spikelets 0.9–1.6 mm long. Leaf margins pectinately ciliate; inflorescence branches in whorls, rachis and branches with abundant round to ovate viscid patches; lower glume linear-lanceolate, longer than 0.5 mm and at least 1/2 the length of the spikelet; upper glume slightly shorter than the spikelet.

Flowering January to May. Amongst trees on sandy soil. Rare. Biome: Savanna. Tropical Africa to Senegal and Ethiopia. One specimen at PRE provided seed from which the remainder of our specimens were cultivated.

Description: Chippindall & Crook 1976 (109), Clayton et al. 1970–1982 (358). Voucher: De Winter 9261. PRECIS code 9902830–03350.

***Sporobolus subtilis* Kunth**

Misty dropseed.

Perennial; rhizomatous (rhizome slender and creeping), or stoloniferous (sometimes), or tufted; 320–600 mm tall. Leaf blades 40–150 mm long. Spikelets 1.5–3.0 mm long. Culms wiry; few basal leaves; panicle dichotomously branched with long stiff hairs in the axils; rachilla extending into a rudimentary floret between the upper glume and the palea.

Flowering November to January. Shallow sandy soil in moist areas. Locally common (often in pure stands). Biome: Savanna and Grassland. Tropical Africa to Sierra Leone,

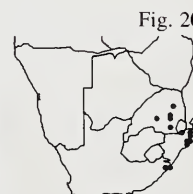


Fig. 201.

also in Madagascar. The rachilla extension in this species is unique for the genus. Similar to *S. conrathii*, which has a fibrous base, and *S. welwitschii*, which has a panicle with few hairs in the axils.

Description: Goossens 1938 (221), Stapf 1898–1900 (588), Chippindall 1955 (212), Clayton et al. 1970–1982 (386). Illustration: Chippindall 1955 (fig. 186), Clayton et al. 1970–1982 (fig. 103). Voucher: Huntley 700. PRECIS code 9902830–03400.

Sporobolus tenellus (Spreng.) Kunth

Pankweck.

Mat-forming perennial; rhizomatous (rhizome long and profusely branched); 60–280 mm tall. Leaf blades 5–35 mm long; 1–3 mm wide. Spikelets 1.5–1.8 mm long. Leaf blades short and rounded at the tips, mostly basal; culms usually one-noded; panicle dichotomously branched with spikelets solitary at the branch tips.

Flowering November to April. Shallow soils at pan edges or in moist depressions. Locally common. Biome: Savanna and Nama-Karoo. Possibly endemic. Very similar to *S. salsus*, which has larger spikelets, and *S. acinifolius*, which has leaf blades 40–120 mm long and tapering to a fine point.

Description: Goossens 1938 (194), Launert 1970 (160:185), Stapf 1898–1900 (580), Chippindall 1955 (214). Voucher: Acocks 12511. PRECIS code 9902830–03500.



Sporobolus virginicus (L.) Kunth

Seaside rush grass.

Mat-forming perennial; stoloniferous, or rhizomatous (rhizomes extensively creeping); 110–770 mm tall. Leaf blades 50–150 mm long; 1–7 mm wide. Spikelets 1.7–2.5 mm long. Leaf blades convolute and pungent; panicle spike-like, branches not whorled; lower glume 3/4 the spikelet length; upper glume as long or slightly longer than the spikelet.

Flowering October to April. On dunes, beaches and along tidal streams on sand. Mostly along the coast but also inland at saline water edges. Common (along coasts). Biome: Fynbos, Savanna, Succulent Karoo, and Desert. Tropical and subtropical regions worldwide. Erosion control (on sand dunes). Specimens of this species can vary from soft, very fine and delicate plants to large and robust plants. Similar to *S. albicans*, *S. bechuanicus* and *S. spicatus*, which all have shorter glumes.

Description: Goossens 1938 (207), Launert 1970 (160:186), Chippindall 1955 (227), Clayton et al. 1970–1982 (370). Illustration: Chippindall 1955 (fig. 200). Voucher: Strey 7325. PRECIS code 9902830–03600.



Sporobolus welwitschii Rendle

(=*S. macrothrix* Pilg.) 2; (=*S. baumianus* Pilg.) 3.

Perennial; rhizomatous and tufted; 600–700 mm tall. Leaf blades 40–80 mm long; mostly filiform, but to 2 mm wide. Spikelets 0.8–2.1 mm long. Plants wiry with few leaves; leaves mostly cauline; panicle dichotomously branched with a few long stiff hairs in some of the axils; spikelets solitary on the tips of delicate branches; glumes unequal, lower glume 1/2, upper glume 2/3 the spikelet length.

Flowering December to February. Brackish sandy loam on the edge of pans or woodlands. Rare. Locally common. Biome: Savanna. Similar to *S. conrathii* and *S. subtilis*, which have panicles with many hairs in almost all the axils and glumes more or less equal and 1/2 the spikelet length.

Description: Launert 1970 (160:186), Chippindall 1955 (212). Voucher: Rogers 25106. PRECIS code 9902830–03700.



Sporobolus sp. (=Smook 3429)

Mat-forming perennial; rhizomatous (rhizome long and deeply buried); 130–320 mm tall. Leaf blades 20–100 mm long; 3.0–4.5 mm wide (mostly inrolled). Spikelets 1.8–2.9 mm long. Leaves rigid; panicle ovate, not whorled, less than three times longer than wide; glumes usually keeled along the whole length or at least at the tip, keel scabrid; lower glume 2/3 to slightly shorter than the spikelet; upper glume 3/4 to slightly longer than spikelet.

Flowering November to April. Brackish soils in or near salt pans. Locally common (brackish soils). Biome: Savanna. Endemic. Although this group of specimens is habitat specific and can easily be distinguished from other *Sporobolus* species, its status is a little uncertain. Spikelet characters are very variable within a single panicle and of little use in identification, possibly indicating a hybrid origin.

Voucher: Smook 3429. PRECIS code 9902830–99999.



Fig. 201. *Sporobolus subtilis*

Stenotaphrum Trin.

Diastemenanthe Steud., *Ophiurinella* Desv.

Perennial; long-rhizomatous, or long-stoloniferous, or caespitose. Culms 100–600 mm high; herbaceous; branched above. Leaf blades lanceolate to elliptic; flat, or folded (when young). *Ligule a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets all alike in sexuality.*

Inflorescence of spike-like main branches, or a false spike, with clusters of spikelets on reduced axes, or paniculate (spikelets 1 to several, in very short spike-like racemes embedded in hollows of the common axis, or in longer racemes closely appressed to it); spatheate (the small racemes subtended/enclosed by spathes which are laterally adnate to the rachis), or espatheate. Spikelet-bearing axes very much reduced (or coalesced with the main axis); disarticulating; falling entire (the free racemes falling with the joint of the main axis), or disarticulating at the joints (when the 'spikelet bearing unit' consists of a coalesced main axis and branches).

Spikelets abaxial; compressed dorsiventrally; falling with the glumes. Glumes two; very unequal; awnless; very dissimilar (lower minute, scale-like, upper large, substantial), or similar (both small, scale-like). *Proximal incomplete florets 1; paleate, or epaleate, palea when present fully developed; male, or sterile (rarely). Proximal lemmas 7–9 nerved.*

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (papery to subcoriaceous); smooth to striate; not

becoming indurated; hairless; having the margins lying flat and exposed on the palea; with a clear germination flap; 3–5 nerved; entire; awnless. Palea present; relatively long. Lodicules 2; fleshy. Stamens 3. Ovary glabrous. Fruit small, ellipsoid; hilum short; embryo large.

Photosynthetic pathway. C₄; XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicodae; Paniceae. 7 species. Tropical and subtropical. Mesophytic; in open habitats (usually maritime); maritime-arenicolous to halophytic, or glycophytic. Namibia, Transvaal, Swaziland, Natal, and Cape Province. 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by H.M. Anderson.

1(0). Axis of inflorescence almost cylindrical, without notches; spikelets 1–3, more or less embedded in the axis ***S. secundatum***

Axis of inflorescence flat on one surface, with widely spaced notches along the edges; spikelets 2–7, each fitting into a shallow cavity ***S. dimidiatum***

Stenotaphrum dimidiatum (L.) Brongn.

Perennial; extensively stoloniferous (forming dense swards); 60–400 mm tall. Leaf blades 50–80 mm long (keeled); 8–12 mm wide. Spikelets 4–5 mm long; 1–2 mm wide. Leaf-sheaths strongly flattened, folded, often grouped in fan-shaped arrangements; the spike-like raceme compact and compressed, central axis thick, swollen, flat on one surface, hollowed out on the other, each cavity containing 2–7 spikelets in short racemes borne alternately on either side of a wavy midrib, the edge of each cavity with a broad acute tooth.

Flowering October to May. A coastal pioneer along beaches and marshes, by saline and fresh water. Infrequent. Pan-tropical and in warm temperate areas. Pasture and ornamental (lawns).

Description: Chippindall & Crook 1976 (187). Voucher: Eglinton 34412. PRECIS code 9901080–00100.

Stenotaphrum secundatum (Walt.) Kuntze

Fig. 202. Pl. 184.

Buffalo grass.

Perennial, extensively stoloniferous (forming dense swards); 60–400 mm tall. Leaf blades 50–150 mm long (keeled); 4–10 mm wide. Spikelets 4–5 mm long; 1–2 mm wide. Leaf sheaths strongly flattened, folded and often grouped in fan-shaped arrangements; the spike-like raceme compact and cylindrical, central axis thick, swollen, flat on one surface, deeply hollowed out on the other, each cavity usually containing one spikelet (sometimes 2–3) borne alternately on either side of a wavy midrib.

Flowering October to May. A coastal pioneer along beaches and marshes, by saline and fresh water. Locally common. Pan-tropical and in warm temperate areas. Pasture and ornamental (lawns). The Cape deme (a sterile triploid clone) is widely cultivated.

Description: Chippindall 1955 (367). Illustration: Chippindall 1955 (fig. 316). Voucher: Smook 3130. PRECIS code 9901080–00200.



Fig. 202. *Stenotaphrum secundatum*



Stereochlaena Hackel

Chloridion Stapf.

Annual, or perennial; long-stoloniferous, or caespitose. Culms 600–1500 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear to linear-lanceolate; flat. *Ligule a fringed membrane*. Plants bisexual, with bisexual spikelets.

Inflorescence of spike-like main branches (slender spike-like racemes); digitate or subdigitate; espatheate. Spikelet-bearing axes persistent.

Spikelets in pairs; biseriate; consistently in 'long-and-short' combinations (but homogamous). Spikelets 2–4.5 mm long; abaxial; compressed dorsiventrally; falling with the glumes. Glumes one or two per spikelet; minute, or relatively large (G1 is minute or absent, while G2 may be minute to almost as long as the spikelet); when both present very unequal; awned (G2 only, sometimes), or awnless; when both present very dissimilar. *Lower glume when present 0 nerved. Proximal incomplete florets 1*; paleate, or epaleate (?), palea when present reduced; sterile. *Proximal lemmas awned (the terminal awn from 3–30 mm long).*

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (papery); not becoming indurated (brown); hairless; having the margins lying flat and exposed on the palea; with a clear germination flap; 3 nerved (faintly); entire; awnless (sometimes apiculate). Palea present; relatively long. Stamens 3. Ovary glabrous. Fruit small (about 1.7 mm long), elongate ellipsoid; hilum short (punctiform); embryo large (about 1/3 the fruit length).

Photosynthetic pathway. C₄; XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Panicoideae; Panicoideae; Paniceae. 5 species. Tropical east Africa. Mesophytic; in open habitats (savanna grasslands); glycophytic. Botswana (?) and Transvaal. 1 indigenous species.



Fig. 203. *Stereochlaena cameronii*

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Stereochlaena cameronii (Stapf) Pilg.

Fig. 203. Pl. 185.

Perennial; sometimes stoloniferous and tufted; 600–1000 (–1200) mm tall. Leaf blades 80–250 mm long; 2–8 mm wide. Spikelets 2.0–3.5 mm long. Basal sheaths hairy; lower lemma with a straight awn 5–20 mm long; female-fertile floret dark brown at maturity.



Flowering January to May. Dry sandy grassland. Infrequent. Biome: Savanna. To east tropical Africa. Related to *Digitaria*, which does not have awned lemmas. The awned digitate racemes give a superficial resemblance to *Chloris*, which has laterally compressed spikelets that fall above the glumes.

Description: Chippindall 1955 (425), Clayton et al. 1970–1982 (656). Illustration: Chippindall 1955 (fig. 353). Voucher: Galpin 11345. PRECIS code 9900910–00100.

Stiburus Stapf

Sometimes included in *Eragrostis* Wolf.

Annual; caespitose. Culms 100–630 mm high; herbaceous; unbranched above. *Ligule a fringed membrane* (very narrow), or a fringe of hairs.

Inflorescence paniculate; contracted; elongated-symmetrical, spike-like (purplish); non-digitate; espatheate. Spikelet-bearing axes persistent.

Spikelets 4 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. Rachilla prolonged beyond the uppermost female-fertile floret. Hairy callus present (but minute). Glumes two; very unequal, or more or less equal; decidedly shorter than the adjacent lemmas, or long relative to the adjacent lemmas; awnless; similar. Upper glume 1 nerved. Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 1–5. Lemmas similar in texture to the glumes (thin); without a germination flap; 3 nerved; entire; mucronate (excurrent into the micro). Palea present; relatively long, or conspicuous but relatively short. Lodicules 2; fleshy (tiny); glabrous. Stamens 3 (anthers minute). Ovary glabrous. Fruit small (about 2 mm); hilum short; pericarp fused (probably).

Photosynthetic pathway and related features. C₄; XyMS+ (the ms cells very large, larger than the pcr cells, with very thick walls). PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chloridoideae; Chloridoideae *sensu lato*. 2 species. Southern Africa. Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Phillips. 1982. Kew Bull. 37:133.

Species treatment by M. Koekemoer.

- 1(0). Glumes and lemmas very densely hairy, dark purple to black, tips acuminate; panicle 30–90 mm long; leaves almost always overtopping the inflorescences; plants flowering February to May *S. alopecuroides*
 Glumes and lemmas hairy, light purple to yellow, tips acute; panicle less than 25 mm long; leaves seldom overtopping the inflorescences; plants flowering August to December *S. conrathii*

***Stiburus alopecuroides* (Hack.) Stapf**

Perennial; rhizomatous and tufted; 170–630 mm tall. Leaf blades 90–360 mm long; 2 mm wide. Spikelets 2.7–4.0 mm long. Inflorescences rarely overtopping the leaves; glumes and lemmas very densely hairy, dark purple to black, tips acuminate.

Flowering February to May. Open veld, mostly sourveld, at fairly high altitudes, in fertile soil and wet areas. Locally common. Biome: Savanna and Grassland. Zimbabwe. Phenologically distinct from *S. conrathii*, which flowers from August to December.

Description: Stapf 1898–1900 (697), Chippindall 1955 (186). Illustration: Chippindall 1955 (fig. 161). Voucher: Mohle 351. PRECIS code 9904000–00100.

***Stiburus conrathii* Hack.**

Perennial; rhizomatous and tufted; 100–410 mm tall. Leaf blades 30–100 mm long. Spikelets 1.7–3.0 mm long. Inflorescences usually overtopping the leaves; glumes and lemmas hairy, light purple to yellow, tips acute.

Flowering August to December. Damp or wet areas in mountain sourveld. Locally common (to infrequent). Biome: Grassland (in mountains). Phenologically distinct from *S. alopecuroides*, which flowers from February to May.

Description: Chippindall 1955 (186). Voucher: Rogers 24049. PRECIS code 9904000–00200.

Fig. 204. Pl. 186.



Fig. 204. *Stiburus alopecuroides*

***Stipa* L.**

Achnatherum P. Beauv., *Aristella* Bertol., *Jarava* Ruiz & Pavon, *Lasiagrostis*, *Macrochloa* Kunth, *Orthoraphium* Nees, *Ptilagrostis* Griseb., *Spartium* P. Beauv., *Timouria* Roshev.

Perennial (rarely annual — e.g. *S. capensis*, *S. parvula*); caespitose. Culms 100–2500 mm high; woody and persistent (rarely), or herbaceous; branched above, or unbranched above. Leaf blades linear; flat, or folded, or rolled. *Ligule an unfringed membrane, or a fringed membrane.*

Inflorescence paniculate; open, or contracted; espathate. Spikelet-bearing axes persistent.

Spikelets not in distinct 'long-and-short' combinations; 3–12 mm long (narrow); compressed laterally; disarticulating above the glumes. *Rachilla terminated by a female-fertile floret. Hairy callus present (long and sharp-pointed, except in Ptilagrostis).* Glumes two; more or less equal; about equalling the spikelets to much exceeding the spikelets; awnless, or awned (sometimes aristate); similar. All florets female-fertile only; *proximal incomplete florets absent.*

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (narrow, convolute); hairy, or hairless (rarely); without a germination flap; 3–7 nerved; entire, or incised (shortly 2-toothed in *Ptilagrostis*); awned. *Awns 1*; median; from the sinus (*Ptilagrostis*), or apical; geniculate (or sometimes bi-geniculate); hairless, or hairy, or long-plumose; much shorter than the body of the lemma, to much longer than the body of the lemma. *Palea* usually present (enclosed by the lemma); relatively long (usually), or conspicuous but relatively short to very reduced (rarely); *indurated (more or less, at least the exposed part)*; 2-nerved, or nerveless (rarely). Lodicules 2 (rarely), or 3; fleshy, or membranous (stipoid); glabrous. Stamens 3. Ovary glabrous. Fruit small, or medium sized, or large; fusiform; hilum long-linear; pericarp fused; embryo small.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 9, 10, 11, 12$, and 22. Arundinoideae; Stipeae. 300 species. Tropical and temperate. Mesophytic to xerophytic. Shade species and in open habitats; glycophytic. Transvaal, Orange Free State, Natal and Cape Province. Indigenous species (3), naturalized species (4).

Intergeneric hybrids with *Oryzopsis* — *X Stiporyzopsis* B.L. Johnson & Rogler.

References. 1. De Winter. 1965. *Bothalia* 8: 212. 2. Caro. 1966. *Kurtziana* 3: 79. 3. Clayton. 1970. *FTEA*.

Species treatment by G.E. Gibbs Russell.

- 1(0). Glumes less than 5 mm long; leaf blades tightly rolled; plants very densely tufted; perennial ***S. tenuissima***
Glumes more than 5 mm long; leaf blades expanded or rolled; plants loosely to densely tufted; annual or perennial 2
- 2(1). Glumes about 15 mm long 3
Glumes 5–10 mm long 4
- 3(2). Glumes colourless, translucent, shining; lemma lacking a raised collar around base of awn; plant annual, to 500 mm tall, usually shorter ***S. capensis***
Glumes dark purple; lemma with a raised collar around base of awn; plant perennial, about 1000 mm tall ***S. neesiana***
- 4(2). Lemma with a conspicuous brush of shining white hairs 4–5 mm long at upper end; glumes shorter than floret ***S. papposa***
Lemma shortly hairy all over, lacking a brush of long hairs at upper end; glumes longer than floret 5
- 5(4). Glumes 9–10 mm long; awns sinuous, to 50 mm long ***S. variabilis***

- Glumes 5–7 mm long; awns straight or bent and twisted, to 20 mm long 6
 6(5). Leaf blades narrowly rolled, to 1 mm across; open veld *S. clandestina*
 Leaf blades expanded, flat, to 12 mm across; forest 7
 7(6). Panicle open, with long spreading flexuous branches bearing spikelets only towards the end *S. dregeana* var. *elongata*
 Panicle dense, with short ascending branches bearing spikelets from near the base *S. dregeana* var. *dregeana*

***Stipa capensis* Thunb.**

(=*S. tortilis* Desf.) 1.

Annual; 100–500(–1000) mm tall. Leaf blades 50–200 mm long; to 3 mm wide. Spikelets 12–16 mm long (excluding the bent and twisted awn 50–80 mm long). Glumes colourless, translucent, shining.

Flowering August to November. Open veld and disturbed places in arid winter rainfall regions. Infrequent. Biome: Nama-Karoo and Succulent Karoo. Also in north Africa and the Middle East.

Description: De Winter 1965 (217), Chippindall 1955 (290). Illustration: Chippindall 1955 (fig. 259). Voucher: Acocks 14736. PRECIS code 9902630–00100.

***Stipa clandestina* Hack.**

Perennial; densely tufted (in big hard tufts); 500–1500 mm tall. Leaf blades to 750 mm long; about 1 mm wide (rolled, setaceous). Spikelets 5–7 mm long (excluding bent and twisted awn to 20 mm long). Lemmas shortly hairy all over.

Flowering November to May. Disturbed places in veld. Infrequent. Naturalized from Mexico. Biome: Nama-Karoo. Pasture (readily eaten, green in winter), or weed.

Description: Hackel 1910 Feddes Rep. 8 (516). Voucher: Acocks 19284. PRECIS code 9902630–00150.

Stipa dregeana* Steud. var. *dregeana

Similar to var. *elongata* but with panicle narrow, branches to 100 mm long, bearing spikelets nearly from the base.

Biome: Forest. Endemic.

Description: De Winter 1965 (215), Chippindall 1955 (289). Voucher: Brynard 30. PRECIS code 9902630–00200.

***Stipa dregeana* Steud. var. *elongata* (Nees) Stapf**

Pl. 187.

Perennial; tufted and rhizomatous (rhizomes short, knotted); 900–1200 mm tall. Leaf blades to 60 mm long; to 12 mm wide. Spikelets 5–7 mm long (excluding straight or bent and twisted awn to 18 mm long). Glumes equal, longer than the lemmas; panicle open, the



Fig. 205. *Stipa dregeana* var. *dregeana*

branches slender, to 200 mm long, spreading, drooping, with spikelets in the upper half only.

Flowering August to May (most common in summer). Moist places in forests. Locally common. Biome: Forest. Also in east African highlands. Easily mistaken for another

erect, broadleaved, long-awned forest grass, *Festuca africana*, which has unequal glumes shorter than the lemmas.

Description: De Winter 1965 (216), Chippindall 1955 (289). Illustration: Chippindall 1955 (fig. 258). Voucher: Killick & Vahrmeijer 4050. PRECIS code 9902630-00300.

***Stipa neesiana* Trin. & Rupr.**

Perennial; tufted (erect); 300–1000 mm tall. Leaf blades to 300 mm long; to 3 mm wide. Spikelets 15–17 mm long (excluding scabrous bent and twisted awn to 100 mm long). Glumes dark purple; lemma with a raised collar at junction of awn.

Flowering November to December. Disturbed places. Infrequent, or locally common. Naturalized from South America. Weed (in cultivated lands).

Voucher: Fanshawe 1976–11–05. PRECIS code 9902630-00400.

***Stipa papposa* Nees**

Perennial; tufted; to 600 mm tall. Leaf blades to 200 mm long; 1–2 mm wide (rolled). Spikelets 8–10 mm long (excluding fine bent and twisted awn to 30 mm long). Glumes shorter than floret; lemma with a conspicuous brush of shining white hairs at upper end.

Flowering December to January. Roadsides. Rare. Naturalized from South America. Biome: Fynbos. Weed. Known only from a single population on the University of Cape Town campus, collected in 1963 and 1980.

Voucher: Esterhuysen 30599a. PRECIS code 9902630-00450.

***Stipa tenuissima* Trin.**

Perennial; very densely tufted; 250–1000 mm tall. Leaf blades to 700 mm long; 0.5 mm wide (tightly rolled, setaceous). Spikelets 4.0–5.0(–5.5) mm long (excluding fine bent and twisted awn to 30 mm long). Glumes not swollen around floret at base; floret symmetrical, tapering at both ends, awn centrally placed.

Flowering January. Open veld. Rare. Naturalized and invader from South America. Biome: Nama-Karoo. Declared weed. Very similar vegetatively to *Nassella trichotoma*, which has the floret rounded at the upper end and the awn asymmetrically placed.

Voucher: Van Graan 411. PRECIS code 9902630-00500.

***Stipa variabilis* Hughes**

Perennial; tufted; to 700 mm tall. Leaf blades to 150 mm long; 1–2 mm wide (rolled). Spikelets 9–10 mm long (excluding sinuous awn to 50 mm long). Lemma shortly hairy all over.

Flowering October. Roadsides. Rare. Naturalized from Australia. Biome: Fynbos. Potential weed. So far known only from a single specimen collected at Atlantis.

Voucher: Smook 3617. PRECIS code 9902630-00700.

***Stipagrostis* Nees**

Schistachne Fig. & De Not.

Annual (rarely), or perennial; caespitose. Culms 100–2000 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear (narrowly); flat (rarely), or folded, or rolled (or subterete). Ligule a fringe of hairs.

Inflorescence paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 7–20 mm long (?); compressed laterally to not noticeably compressed; disarticulating above the glumes. Rachilla terminated by a female-fertile floret. Glumes two; very unequal, or more or less equal; long relative to the adjacent lemmas (usually exceeding it); awnless; similar (scarious). Lower glume 3 nerved (usually). All florets female-fertile only; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (leathery, the glumes membranous); hairless (usually glabrous or scabrid); with a clear germination flap; 3 nerved; awned. Awns usually triple or trifid, commonly



Fig. 206. *Stipagrostis uniplumis* var. *uniplumis*

with a basal column, or not of the triple/trifid, basal column type (*S. anomala*); apical; non-geniculate (at least, not geniculate in the usual sense); long-plumose (usually, at least on the median branch), or hairless (*S. anomala*); much longer than the body of the lemma. Palea present (but small); conspicuous but relatively short (usually less than half lemma length); 2-nerved. Lodicules when present 2; membranous; glabrous. Stamens 3. Ovary glabrous. Fruit fusiform; hilum long-linear; pericarp fused; embryo large.

Photosynthetic pathway, C_4 ; XyMS+ (and PCR sheath single, by contrast with *Aristida*).

Cytology, classification, distribution. Chromosome base number, $x = 11$. Arundinoideae; Aristideae. 50 species. Africa, southwest Asia, northwest India. Xerophytic; in open habitats (desert and semidesert, sometimes dunes — e.g. *S. ciliata* being a sandbinder). Namibia, Botswana, Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. 27 indigenous species.

References. 1. De Winter. 1965. Bothalia 8:199. 2. Kers. 1971. Svensk. Bot. Tidskr. 65: 199.

Species treatment by L. Smook.

- 1(0). Awn solitary (protruberances indicating two lateral awns sometimes present), awn not plumose except for a pencil of long white hairs around the base of the column; articulation present between the apex of the lemma and the base of the column *S. anomala*
Awns three, either all three or only the central awn distinctly and densely plumose; articulation absent or present 2
- 2(1). Lemma articulation absent *S. zeyheri* subsp. *sericans*
Lemma articulation present 3
- 3(2). Callus minutely bifid *S. obtusa*
Callus never bifid 4
- 4(3). All three awns distinctly plumose with long hairs (lateral awns indistinctly plumose with short and/or scattered, long hairs) 5
Only central awn distinctly plumose, lateral awns glabrous or with short hairs and/or scattered long hairs, not distinctly plumose 15
- 5(4). Lemma articulation near the middle of the lemma 6
Lemma articulation near the apex of the lemma 7
- 6(5). Spikelets to 14 mm long (including awns); upper glume 7–9 mm long *S. proxima*
Spikelets 15–30 mm long (including awns); upper glume 10–14 mm long *S. namaquensis*
- 7(5). Plants delicate, culms to 1.2 mm wide; upper glume 7–9 mm long; lower leaf surface rough, densely covered with prickles *S. ramulosa*
Plants robust or reed-like, culms 1.2–5.0 mm wide; upper glume 9–25 mm long; lower leaf surface smooth, prickles absent, or present only on the side of the nerves in the intercostal cavities 8
- 8(7). Plant reed-like; leaves rigid, straight and pungent, overtopping the narrow dense inflorescence; column very short and stout *S. sabulicola*
Plants robust, but not reed-like; inflorescence usually extending beyond the leaves, if overtopped by the leaves, then leaves flaccid and often curling with age; column long, or if short, then slender 9
- 9(8). Column hairy with long hairs for at least some distance below branching point of the awns 10
Column glabrous or scaberulous or with only a few scattered hairs around the branching point of the awns 12
- 10(9). Glumes densely hairy with long hairs, or sometimes only hairy at the glume apex *S. zeyheri* subsp. *sericans*
Glumes glabrous, puberulous or scabrid 11
- 11(10). Leaves erect and rigid; inflorescence usually open; glumes usually purple; plant often tinged purple; mainly from the winter rainfall area *S. zeyheri* subsp. *zeyheri*
Leaves flaccid, often curling; inflorescence usually narrow; glumes pallid, slightly darker at the base; plant sometimes faintly flushed with purple; coastal areas of eastern Cape and northern Natal *S. zeyheri* subsp. *barbata*
- 12(9). Inflorescence narrow, compact, the branches appressed to the main axis; callus bluntly rounded; awns plumose with long silver-white hairs *S. damarensis*
Inflorescence open; callus pungent; awns plumose with long dirty-white, yellow or silver hairs 13
- 13(12). Glumes longer than 15 mm; awns plumose with long dirty-white or yellow hairs *S. zeyheri* subsp. *macropus*
Glumes shorter than 15 mm; awns plumose with long silvery hairs 14
- 14(13). Axils of inflorescence branches glabrous; culm nodes glabrous *S. lutescens* var. *lutescens*
Axils of inflorescence branches distinctly bearded; culm nodes hairy *S. lutescens* var. *marlothii*
- 15(4). Lemma articulation at or just above the middle of the body of the lemma 16
Lemma articulation at the apex of the lemma 22
- 16(15). Lower glume narrowly oblong to oblong, apex firm, obtuse to truncate 17
Lower glume linear to lanceolate, apex membranous, acute to long-acuminate 18
- 17(16). Culm nodes bearded with a ring of long, spreading white hairs; lower leaf sheaths not covered with a mat of woolly hairs *S. ciliata* var. *capensis*
Culm nodes glabrous; lower leaf sheaths sparsely to densely covered with matted woolly hairs *S. schaeferi*
- 18(16). Plants suffrutescent; culms with branches fascicled; central awn usually to 35 mm long *S. amabilis*
Plants tufted, not woody; culms branched or unbranched, branches not fascicled; central awn usually 40–100 mm long 19
- 19(18). Inflorescence narrow, spike-like, unbranched 20
Inflorescence narrow, interrupted, branched 21
- 20(19). Lower glume with long, rigid, erect hairs *S. hochstetteriana* var. *hochstetteriana*
Lower glume without long erect hairs *S. hochstetteriana* var. *secalina*
- 21(19). Glumes softly pilose, especially along the margins near the apex; central awn plumose right to the tip; lateral awns up to 1/3 the length of the central awn; culms with striations indistinct or widely separate, densely scabrid, covered with conspicuous prickles *S. dinteri*
Glumes not softly pilose; central awn excurrent into a delicate naked tip; lateral awns at least 1/2 the length of the central awn; culms with striations distinct and close together, smooth or minutely scaberulous, with small inconspicuous prickles (Note: *S. giessii* X *hochstetteriana* has glumes with long stiff hairs) *S. giessii*
- 22(15). Leaves mainly cauline, with well to poorly developed leaf blades; plants usually suffrutescent 23
Leaves apparently mainly basal, with well developed leaf blades; plants not woody 28
- 23(22). Glumes with long white hairs 24
Glumes glabrous or with only very short hairs 25
- 24(23). Inflorescence not or only slightly exerted from uppermost leaf sheath, spikelet fascicles densely clustered, lowermost sometimes separated from the rest; leaf blades poorly developed *S. geminifolia*
Inflorescence well exerted from uppermost leaf sheath; spikelet fascicles much interrupted along the main axis; leaf blades well developed *S. fastigiata*

- 25(23). Plants with raised, round glands . . . *S. brevifolia*
Plants without raised, round glands 26
- 26(25). Plants slender in the upper parts; leaves flexuous,
usually held at an angle of 45 degrees from the
culm, to 1 mm wide *S. garubensis*
Plants robust in upper parts; leaves rigid, usually at
an angle of 90 degrees from the culm, 1–2 mm
wide 27
- 27(26). Axils of inflorescence branches glabrous; culm
nodes glabrous . . . *S. lutescens* var. *lutescens*
Axils of inflorescence branches distinctly bearded;
culm nodes hairy . . . *S. lutescens* var. *marlothii*
- 28(22). Glumes with obvious, long hairs, though sometimes
along the margins only 29
Glumes puberulous, scabrid or glabrous 33
- 29(28). Inflorescence spiciform, subsecund; culms not
visibly or obviously striate, usually densely
scabrid *S. gonatostachys*
Inflorescence open or contracted but not spiciform
and subsecund; culms conspicuously striate,
smooth 30
- 30(29). Callus with short hairs along the entire length
(except for the naked tip), meeting the long hairs
at the junction between the lemma and the callus;
plants annual (Note: *S. uniplumis* X *hirtigluma*
is perennial) . . . *S. uniplumis* var. *intermedia*
Callus with a distinct glabrous break between the
short hairs along the length of the callus and the
long hairs at the junction of the lemma and the
callus; plants annual or perennial 31
- 31(30). Inflorescence narrow, when fully exerted much
longer than wide; plants annual
. *S. hirtigluma* subsp. *hirtigluma*
Inflorescence open, spreading, when fully exerted
not much longer than wide; plants annual or
perennial 32
- 32(31). Plants annual with very few leaves at the base . .
. *S. hirtigluma* subsp. *pearsonii*
Plants perennial with a dense tuft of basal leaves
. *S. hirtigluma* subsp. *patula*
- 33(28). The branching point of the awns and a short
distance down the column with hairs longer than
1.5 mm 34
The branching point of the awns and a short
distance down the column glabrous, scabrid or
with hairs shorter than 1.5 mm 35
- 34(33). Inflorescence with numerous spikelets; glumes
usually to 10 mm long; central awns usually
straight *S. uniplumis* var. *uniplumis*
Inflorescence with a few spikelets; glumes 10 mm
or longer; central awns bent at right angles . . .
. *S. uniplumis* var. *neesii*
- 35(33). Inflorescence subsecund, branched only in the
lower part, spikelets in the upper part solitary,
borne on robust, rigid pedicels directly on the
main axis *S. gonatostachys*
Inflorescence not subsecund, much branched for
most of its length, spikelets paired or solitary,
borne on slender, usually flexuous pedicels from
the branches 36
- 36(35). Inflorescence contracted and very dense, main axis
hidden 37
Inflorescence open or contracted, interrupted, main
axis clearly visible 38
- 37(36). Column densely short-hairy at the swollen
branching point of the awns; callus 1.5 mm long;
culms well developed and extending somewhat
beyond the basal tuft of leaves . . . *S. hermannii*
Column glabrous, sometimes with a few scattered
hairs around branching point of awns; callus
0.8–1.0 mm long; culms very poorly developed
and short *S. subacaulis*
- 38(36). Column hairy; plants annual *S. namibensis*
Column smooth, glabrous or densely scabrid; plants
usually perennial 39

- 39(38). Inflorescence open, branches with long naked basal
parts; glumes dark; column smooth
. *S. dregeana*
Inflorescence contracted, interrupted, branches
bearing spikelets to near the base; glumes pallid;
column usually densely scabrid 40
- 40(39). Lower leaf sheaths densely covered all over with
matted woolly hairs; plants rare *S. lanipes*
Lower leaf sheaths glabrous, if hairy these not
matted woolly hairs and present only at the very
base; plants common *S. obtusa*

Stipagrostis amabilis (Schweick.) De Winter

(=*Aristida amabilis*
Schweick.) 1.

Kalahari dune bushman grass,
duinekweek.



Shrub or dwarf shrub; rhizomatous (rhizomes long, creeping), or tufted (culms erect or horizontal); 1500–2000 mm tall. Leaf blades curved, sharp, to 250 mm long; to 2.5 mm wide. Spikelets 11–14 mm long (excluding awns). Culms with branches fasciated at nodes, internodes distinct; inflorescence narrow, interrupted, with spikelets crowded, pedicels erect; glumes unequal; lower glume lanceolate, long-acuminate; lemmas smooth, articulation at about the middle of the lemma; column short to almost absent; central awn to 35 mm long, plumose for the upper 2/3, lateral awns not plumose; callus 1.5 mm long, tip naked, pungent.

Flowering sporadic from August to May. On the crest of Kalahari sand dunes. Locally common. Biome: Savanna and Nama-Karoo. Endemic. Erosion control (sand binder on dune crests). Similar to *S. namaquensis*, which has all three awns plumose and shorter leaves with more pungent tips.

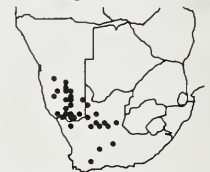
Description: De Winter 1965 (324). Voucher: Leistner 1365. PRECIS code 9902611–00100.

Stipagrostis anomala De Winter

(=*Stipa namaquensis* Pilg.,
non *Stipagrostis namaquensis*
(Nees) De Winter) 1.

Torro-boesmangras.

Fig. 207. Pl. 188.



Weakly perennial or annual; densely tufted (erect or slightly geniculate near base); 100–600 mm tall. Leaf blades scabrid 10–200 mm long; setaceous, to 1.5 mm wide. Spikelets 9–12 mm long (excluding awns). Leaves mainly basal, often curved; inflorescence narrow, interrupted, with spikelets erect, crowded along the main axis; glumes unequal, scaberulous; lemma articulation between the apex of the lemma and the base of the column; column twisted and with long stiff hairs at the base; awn solitary, not plumose, diverging at right angles at maturity, protruberances indicating rudimentary lateral awns are sometimes present; callus 1.5 mm long, pungent.

Flowering January to June (and August and September). Shallow sandy soils over rocks on slopes and gravel plains. Locally common. Biome: Nama-Karoo. Endemic. Although this species has only a single glabrous awn, the three-nerved glumes, hairs at the base of the column and anatomical characters place it in *Stipagrostis* rather than *Aristida*. It differs from the genus *Stipa*, which has a membranous ligule.

Description: De Winter 1965 (375). Illustration: Muller 1984 (fig. 121), Chippindall 1955 (fig. 260). Voucher: Leistner 2362. PRECIS code 9902611–00200.

***Stipagrostis brevifolia* (Nees) De Winter**

(=*Aristida brevifolia* (Nees) Steud.) 1.

Langbeentwagras, kortblaar-boesmangras.

Robust shrub or dwarf shrub (culms much branched); rhizomatous (rhizomes branched and woody); to 1000 mm tall. Leaf blades usually very short, 5–80(–120) mm long; rolled or expanded, 1–3 mm wide. Spikelets 12–15 mm long (excluding awns). Vegetative parts with raised round glands; nodes densely covered with woolly hairs; leaves mainly cauline; inflorescence narrow, sometimes interrupted, branches appressed to main axis; glumes long acuminate, glabrous; lemma articulation between the apex of lemma and the base of the column; column distinct, scabrid; only the central awn plumose with the lower 1/4 scabrid and the apex not plumose; callus 2.0–2.5 mm long, with a naked, pungent tip.

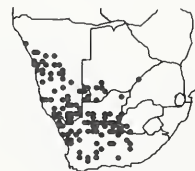


Flowering September to May. Sand over rocks on plains and especially in drainage areas. Locally common. Biome: Nama-Karoo and Succulent Karoo. Endemic. Drought resistant pasture (palatable only when green). Hybridizes with *S. namaquensis*, (De Winter 3266).

Description: De Winter 1965 (338), Stapf 1898–1900 (570). Illustration: Muller 1984 (fig. 122), Chippindall 1955 (fig. 270). Voucher: De Winter & Hardy 7852. PRECIS code 9902611–00300.

***Stipagrostis ciliata* (Desf.) De Winter var. *capensis* (Trin. & Rupr.) De Winter**

(=*Aristida ciliata* sensu Desf., non Steud. & Hochst. ex Steud.) 1; (=*Aristida ciliata* Desf. var. *capensis* Trin. & Rupr.) 1; (=*Aristida ciliata* Desf. var. *pectinata* Henr.) 1; (=*Aristida ciliata* Desf. var. *tricholaena* Hack.) 1; (=*Aristida ciliata* Desf. var. *villosa* Hack.) 1.



Langbeenboesmangras, tall bushman grass.

Densely or laxly tufted (erect or occasionally geniculate); 850–1000 mm tall. Leaf blades to 300 mm long; to 1.5 mm wide. Spikelets 6.5–12 mm long (excluding awns). Leaves mainly basal; sheaths hairy but not woolly, or glabrous; culm nodes with long stiff spreading hairs; inflorescence narrow or open, branches flexuous; spikelets variable in size, straw coloured, often purple at the base; glumes equal to subequal, lower glume oblong to narrowly oblong, apex obtuse to truncate, firm; articulation about in the middle of the lemma; column length variable; only central awn plumose, hairs usually silvery (occasionally golden); callus 2.0–2.5 mm long, with pungent, naked point.

Flowering August to October, and February to June. Coarse sandy soils especially in river beds or on gravel plains. Locally common. Biome: Savanna, Nama-Karoo, Succulent Karoo, and Desert. Also in Tunisia and Egypt. Variable, sometimes hybridizes with *S. zeyeri* subsp. *macropus* (Acocks 14817). Closely allied to *S. schaeferi*, which has glabrous nodes and is far less common.

Description: De Winter 1965 (316), Stapf 1898–1900 (563), Chippindall 1955 (299). Illustration: Muller 1984 (fig. 213), Chippindall 1955 (fig. 265). Voucher: Smook 2896, Oliver, Muller & Steenkamp 6612. PRECIS code 9902611–00400.

***Stipagrostis damarensis* (Mez) De Winter**

(=*Aristida damarensis* Mez) 1.

Robust perennial; laxly tufted (much branched near the base), or rhizomatous (rhizome well developed); to 1200 mm tall. Leaf blades to 300 mm long; 2–3 mm wide. Spikelets 12–14 mm long (excluding awns). Culms 1.2–5.0 mm wide; lower leaf surface with prickles on the nerves but sunk in the intercostal cavities; inflorescence extending beyond the leaves, elongate, narrow, compact, often interrupted, branches appressed to the main axis; spikelets erect; glumes glabrous or pilose near apex and on the margins; upper glume 10–15 mm long; lemma articulation between the apex of the lemma and the base of the column; column long, glabrous, well developed; all three awns completely plumose, with long silver-white hairs; callus 1 mm long, hairy almost to the tip, tip bluntly rounded.

Flowering March to June. River beds and drainage lines. Locally common. Biome: Savanna and Desert. Endemic.



Fig. 207. *Stipagrostis anomala*

Resembles *S. namaquensis*, which has the articulation in the middle of the lemma and the column not as well developed.

Description: De Winter 1965 (329). Voucher: De Winter & Hardy 8131, Giess 7912. PRECIS code 9902611-00500.

***Stipagrostis dinteri* (Hack.) De Winter**

(=*Aristida dinteri* Hack.) 1.

Slender perennial; densely tufted; to 400 mm tall. Leaf blades to 150 mm long; to 1 mm wide. Spikelets 15–16 mm long (excluding awns). Culms, if branched, not in fascicles; vegetative parts densely scabrid, often with round, usually crateriform glands; culms indistinctly striate, or striations widely separate, densely covered with conspicuous prickles; inflorescence narrow, branched, interrupted; glumes pilose with short hairs (at least on the margins); lower glume linear to lanceolate, tapering to a long acuminate apex; lemma articulation just above the middle of the lemma; column of variable length; central awn 40–100 mm long, plumose to the lower 1/3 and to the apex, lateral awns to 1/3 the length of the central awn, not plumose; callus 2 mm long, with a distinct, naked, pungent tip.

Flowering November and February to May. Loose sand in riverbeds and on hills. Locally common. Biome: Nama-Karoo and Desert. North to Angola.

Description: De Winter 1965 (320), Chippindall 1955 (300). Voucher: Giess, Volk & Bleissner 6249, Giess 7984. PRECIS code 9902611-00600.

***Stipagrostis dregeana* Nees**

(=*Aristida dregeana* (Nees) Trin. & Rupr.) 1.

Rock bushman grass.

Laxly to densely tufted (erect to geniculate, branched at base); to 300 mm tall. Leaf blades to 135 mm long (smooth with scabrid margins); setaceous. Spikelets to 12 mm long (excluding awns). Leaves mainly basal; inflorescence open, nearly as long as wide, with main axis visible, branched, branches somewhat flexuous, with long naked basal parts, pedicels slender; glumes glabrous, dark; lemma articulation between the apex of the lemma and the base of the column; column smooth and glabrous to the branching point of the awns; all three awns, or only the central awn plumose; callus 1–3 mm long, tip naked, pungent.

Flowering August and April. Coarse, sandy soils or shallow soils, between rocks and in depressions along roadsides. Infrequent. Biome: Succulent Karoo. Endemic.

Description: De Winter 1965 (344), Stapf 1898–1900 (569). Voucher: Giess & Van Vuuren 682. PRECIS code 9902611-00700.

***Stipagrostis fastigiata* (Hack.) De Winter**

(=*Aristida fastigiata* Hack.) 1.

Shrub or dwarf shrub (suffrutescent, culms fascicled); rhizomatous (rhizomes thick and much branched); to 600 mm tall. Leaf blades to 80 mm long (often much shorter); 2–3 mm wide. Spikelets 15 mm long (excluding awns). Leaves mainly cauline,

blades well developed; inflorescence usually elongate, exerted from the uppermost leaf sheaths; spikelets in fascicles which are lax and interrupted along the inflorescence; glumes densely hairy with long white hairs; lemmas smooth, articulation between the apex of the lemma and the base of the column; column well developed, twisted; only the central awn plumose; callus 2 mm long with a pungent naked tip.

Flowering February to June. Sandy and alkaline soils. Locally common. Biome: Nama-Karoo, Succulent Karoo, and Desert. Endemic. Pasture. Closely related to *S. geminifolia*, which is usually smaller than 300 mm, with the inflorescence as long as wide and the lower part enclosed in the swollen upper leaf sheath, and with spikelet fascicles densely clustered.

Description: De Winter 1965 (338). Illustration: Muller 1984 (fig. 124). Voucher: Acocks 21790, Giess 13436. PRECIS code 9902611-00800.

***Stipagrostis garubensis* (Pilg.) De Winter**

(=*Aristida garubensis* Pilg.) 1.

Shrub or dwarf shrub; base robust, woody and branched; to 600 mm tall. Leaf blades to 120 mm long; to 1 mm wide. Spikelets 12–14 mm long (excluding awns). Plants slender in the upper parts; leaves flexuous, held at 45 degree angles from the culms, pungent; glumes often dark at the base; lemma apex densely tuberculate, articulation between the apex of the lemma and the base of the column; column well developed, slender; only the central awn plumose; callus 1.0–1.5 mm long, with a pungent, naked tip.

Flowering June, July and September. Between rocks, especially granite, on hillslopes and in riverbeds. Locally common. Biome: Succulent Karoo. Endemic.

Description: De Winter 1965 (343). Voucher: Kinges 2289. PRECIS code 9902611-00900.

***Stipagrostis geminifolia* Nees**

(=*Aristida geminifolia* (Nees) Trin. & Rupr.) 1.

Shrub or dwarf shrub; erect or geniculate; to 250 mm tall. Leaf blades usually very short, expanded and rigid 10–(20) mm long; to 2 mm wide. Spikelets 10–14 mm long (excluding awns). Leaves mainly cauline, blades not well developed; inflorescence ovate to oblong, not or only slightly exerted from the uppermost leaf sheath; spikelet fascicles densely clustered, the uppermost sometimes separated from the rest; glumes densely covered with long white hairs; lemma smooth, articulation between the apex of the lemma and the base of the column; column short, glabrous; only the central awn plumose, hairs usually golden; callus 2 mm long, with a pungent, naked tip.

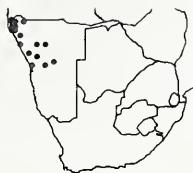
Flowering August to October, and January to June. Coarse sandy soils of watercourses and in open places on gravel plains. Infrequent to locally common. Biome: Succulent Karoo. Endemic. Pasture (eaten by stock). Closely related to *S. fastigiata*, which has an elongated inflorescence exerted from the upper leaf sheath and spikelet fascicles not densely clustered.

Description: De Winter 1965 (341), Stapf 1898–1900 (570). Illustration: Chippindall 1955 (fig. 268). Voucher: Ellis 2181. PRECIS code 9902611-01000.



Stipagrostis giessii Kers

Perennial; tufted; to 800 mm tall. Leaf blades 70–250 mm long; to 2 mm wide. Spikelets 13–22 mm long (excluding awns). Vegetative parts scabrid, culm striations distinct and close together, smooth or scaberulous with minute prickles; leaves mainly basal; inflorescence narrow, with branches of variable lengths; pedicels short, thick, erect; glumes papery, lower glume linear to lanceolate, glabrous, acuminate, tuberculate; lemma articulation is at about the middle of the lemma; column long, slender and twisted; central awn 40–100 mm long, plumose with long hairs on the upper half and excurrent into a delicate naked tip; lateral awns not plumose, stout and at least 1/2 the length of the central awn; callus 2 mm long, with a pungent, naked tip.



Flowering November and March to June. Sandy river beds, stony hills and gravel plains. Locally common. Biome: Savanna, Nama-Karoo, and Desert. North to Angola. Variable; differs from *S. hochstetteriana*, which has an unbranched inflorescence. Hybrids with *S. hochstetteriana* have been reported (De Winter & Hardy 8058).

Description: Kers 1971 (199). Voucher: De Winter & Hardy 8185, Giess & Leippert 7413. PRECIS code 9902611–01100.

Stipagrostis gonatostachys (Pilg.) De Winter

(=*Aristida gonatostachys* Pilg.) 1.

Rough-leaved bushman grass.

Perennial; densely tufted; to 200 mm tall. Leaf blades 40–50 mm long; folded. Spikelets 8–10 mm long (excluding awns). Leaves mainly basal; vegetative parts densely scabrid; culms not conspicuously striate; inflorescence elongate, narrow, spiciform and subsecund, base usually enclosed in upper leaf sheath; glumes scabrid or densely covered with long hairs; lemma smooth, articulation between the apex of the lemma and the branching point of the column; column well developed, scaberulous, if hairy at branching point, hairs less than 1.5 mm long; only the central awn plumose; callus 1.5 mm long with a pungent, naked tip.



Flowering September to December and March to June. Coarse to fine sand between rocks on mountain slopes, and in depression on plains where water collects. Infrequent. Biome: Desert. Endemic. Easily confused with the more widespread *S. obtusa*, which has a shorter callus, an inflorescence which is not subsecund and is well exerted from the upper leaf sheath.

Description: De Winter 1965 (353). Voucher: Giess 13421, De Winter & Hardy 8098. PRECIS code 9902611–01200.

Stipagrostis hermannii (Mez) De Winter

(=*Aristida hermannii* Mez) 1.

Laxly tufted (geniculate to prostrate); to 150 mm tall. Leaf blades densely scabrid 10–20 mm long; to 2 mm wide. Spikelets 9–14 mm long (excluding awns). Culms well developed and extending somewhat from the basal tuft of leaves; inflorescence narrow, dense, much branched for most of its length, with the main axis hidden, the base partly enclosed in the leaf sheath; glumes glabrous, with a



long tapering acuminate apex; lemma articulation between the apex of the lemma and the base of the column; column length variable, densely short-hairy, with hairs shorter than 1.5 mm long on the swollen branching point of the awns; only the central awn plumose; callus 1.5 mm long with a pungent, naked tip.

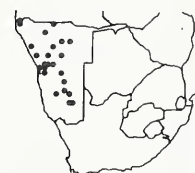
Flowering January to August. Sandy areas on hills and plains. Locally common. Biome: Desert. Endemic. Closely allied to *S. subacaulis*, which has a glabrous column and a callus 0.8–1.0 mm long.

Description: De Winter 1965 (369). Voucher: Giess & Robinson 13212, Dinter 6396. PRECIS code 9902611–01300.

Stipagrostis hirtigluma (Trin. & Rupr.) De Winter subsp. *hirtigluma*

(=*Aristida hirtigluma* Steud. ex Trin. & Rupr.) 1.

Annual; tufted (erect); to 500 mm tall. Leaf blades 60–200 mm long; setaceous. Spikelets 10–15 mm long (excluding awns). Culms conspicuously striate, smooth; leaves mainly basal; inflorescence narrow, much longer than wide; glumes hairy, with long hairs on both sides of central nerve along inner and outer surfaces; lemma articulation between the apex of the lemma and the base of the column; column variable in length and hairiness; only the central awn plumose; callus 0.4 mm long, with a distinct glabrous break between the short hairs on the callus body and the long hairs at the junction between the lemma and the callus, and with a long naked, pungent tip.



Flowering April to May. Not habitat selective, grows on sandy or gravelly soils as well as rocky substrates. Locally common. Biome: Savanna, Nama-Karoo and Desert. To Angola, North Africa, and the desert areas of the Middle East and west Africa. Barely distinguishable from subsp. *pearsonii*, which has an open, spreading inflorescence not much longer than wide, and from subsp. *patula*, which is perennial.

Description: De Winter 1965 (361). Voucher: Giess 3034. PRECIS code 9902611–01400.

Stipagrostis hirtigluma (Trin. & Rupr.) De Winter subsp. *patula* (Hack.) De Winter

(=*Aristida gracilior* Pilg. var. *gracilior*) 1.

Perennial; densely tufted (erect); to 600 mm tall. Leaf blades to 200 mm long; setaceous. Spikelets 12–13 mm long (excluding awns). Culms conspicuously striate, smooth; leaves mostly in dense basal tufts; inflorescence open, spreading, not much longer than wide; glumes brown, usually flushed with purple, densely hairy; lemmas densely tuberculate, articulation between the apex of the lemma and the base of the column; column well developed, stout; only the central awn plumose, the long spreading hairs cover the entire awn and extend for varying lengths down the column; callus 0.7 mm long, with a distinct glabrous break between the short hairs on the callus body and the long hairs at the junction of the lemma and the callus, with a pungent, naked tip.



Flowering February to July. Calcareous soils or sandy areas near limestone around pans, on floodplains or rocky ridges. Locally common. Biome: Savanna. Also in tropical Africa. Hybrids between this var. and *S. uniplumis* var. *neesii* have been reported. They are recognized by being perennial, with hairy glumes and a *S. uniplumis* type callus (Volk 2338).

Description: De Winter 1965 (361 & 365). Voucher: De Winter & Giess 7135. PRECIS code 9902611–01500.

***Stipagrostis hirtigluma* (Trin. & Rupr.) De Winter subsp. *pearsonii* (Henr.) De Winter**

(=*Aristida gracilior* Pilg. var. *pearsonii* Henr.) 1.

Annual; densely tufted (erect to geniculate); to 800 mm tall. Leaf blades to 200 mm long; setaceous. Spikelets 10–13 mm long (excluding awns). Culms conspicuously striate, smooth; leaves sparse at the base; inflorescence open, spreading, not much longer than wide; glumes densely hairy; lemma articulation between the apex of the lemma and the base of the column; column thick; callus 0.7 mm long, with a distinct glabrous break between the short hairs on the body of the callus and the long hairs at the junction of the lemma and the callus, with a pungent, naked tip.

Flowering January to May. Sandy soils on gravel flats, and on stony hills. Locally common. Biome: Savanna, Nama-Karoo and Desert. To Angola. Pasture (not highly palatable but utilized). Barely distinguishable from subsp. *hirtigluma*, which has a narrower inflorescence that is longer than wide when fully exerted, and from subsp. *patula*, which is a more definite perennial.

Description: De Winter 1965 (361). Illustration: Muller 1984 (fig. 125). Voucher: Oertendahl 158, De Winter & Leistner 5621. PRECIS code 9902611–01600.



Stipagrostis hochstetteriana* (Beck ex Hack.) De Winter var. *hochstetteriana

(=*Aristida hochstetteriana* Beck ex Hack.) 1.

Spike bushman grass.

Perennial; densely tufted (erect); to 900 mm tall. Leaf blades 250–400 mm long; 2.0–2.5 mm wide. Spikelets 15–20 mm long (excluding awns). Leaves mainly basal; inflorescence spike-like, narrow, unbranched; pedicels thick; lower glume linear to lanceolate, with long, rigid, erect hairs usually either side of the median keel, apex long acuminate, membranous; lemma articulation around the middle of the lemma; column well developed, slender; central awn 40–100 mm long, plumose in the upper 2/3; lateral awns not plumose; callus 2 mm long with naked, pungent tip.

Flowering November to June. Sandy to clay soils on rocky slopes and on gravels, often calcareous, disturbed areas at roadsides or in river courses. Locally common. Biome: Nama-Karoo and Desert. Endemic (possibly occurring in Angola). Distinguished from var. *secalina*, which has no hairs on the lower glumes, and from *S. giessii*, which has the inflorescences branched. Hybrids with *S. giessii* have been reported (De Winter & Hardy 8097).

Description: De Winter 1965 (313), Stapf 1898–1900 (571), Chippindall 1955 (297). Illustration: Chippindall 1955 (fig. 263). Voucher: Muller 116, De Winter 3254. PRECIS code 9902611–01700.



***Stipagrostis hochstetteriana* (Beck ex Hack.) De Winter var. *secalina* (Henr.) De Winter**

(=*Aristida secalina* Henr.) 1.

Rye bushman grass.

Perennial; densely tufted (erect); to 900 mm tall. Leaf blades to 400 mm long; 2 mm wide. Spikelets 15–20 mm long (excluding awns). Leaves mainly basal; inflorescence spike-like, narrow, unbranched, pedicels thick; lower glume linear to lanceolate, apex long acuminate, membranous, without long, erect, rigid hairs; lemma articulation around the middle of the lemma; column



well developed, slender; central awn 40–100 mm long, plumose, hairs only in the upper 2/3; lateral awns not plumose; callus 2 mm long, with a naked pungent tip.

Flowering February to June. Sandy soil and rocky slopes, especially limestone. Locally common. Biome: Savanna, Nama-Karoo, Desert. To Angola. May cause grass balls in sheep. Similar to var. *hochstetteriana*, which has erect hairs on the back of the lower glume, and to *S. giessii*, which has branched inflorescences.

Description: De Winter 1965 (313). Voucher: Theron 3834, De Winter 3048. PRECIS code 9902611–01800.

***Stipagrostis lanipes* (Mez) De Winter**

(=*Aristida lanipes* Mez) 1.

Woolly bushman grass.

Perennial; densely tufted; to 600 mm tall. Leaf blades to 25 mm long. Spikelets to 9.5 mm long (excluding awns). Leaves mainly basal, lower leaf sheaths densely woolly-hairy; inflorescence contracted, interrupted, much branched, branches bearing spikelets to near the base; glumes glabrous, pallid; lemma articulation between the apex of the lemma and the base of the column; column densely scabrid; only central awn distinctly plumose; callus 1.4–1.6 mm long.

Flowering August. Sandy soils on slopes. Rare. Biome: Succulent Karoo. Endemic if distinct from *S. obtusa*, which occurs in North Africa, Sinai Peninsula and Iraq to Pakistan. There are very few specimens that can definitely be identified as *S. lanipes* and its status as a species distinct from *S. obtusa* is somewhat doubtful.

Description: De Winter 1965 (355). Voucher: De Winter & Giess 6133. PRECIS code 9902611–01900.



Stipagrostis lutescens* (Nees) De Winter var. *lutescens

(=*Aristida lutescens* (Nees) Trin. & Rupr.) 1.

Shrub or dwarf shrub; rhizomatous (rhizome long, branched); 700–1000 mm tall. Leaf blades to 100 mm long; to 2 mm wide (flat). Spikelets 12–14 mm long (excluding awns). Plants robust in upper parts; culms stout, much branched and fascicled in the lower parts, nodes glabrous; leaves mainly cauline, rigid, usually held at 90 degree angles from the culm, relatively short, flat or folded, distinctly pungent; inflorescence open, axils of branches glabrous; glumes 8–14 mm long, glabrous; lemma articulation between the apex of the lemma and the base of the column; column well developed, glabrous or occasionally hairy; all three awns or only the central awn plumose; callus 2.0–2.5 mm long, with a narrow, pungent, naked tip.

Flowering March, and July to October. Sandy soils. Infrequent. Biome: Succulent Karoo. Endemic. Similar to var. *marlothii*, which has hairy nodes and hairs in the axils of the inflorescence branches.

Description: De Winter 1965 (334), Stapf 1898–1900 (567). Voucher: Schlieben 11480. PRECIS code 9902611–02000.



***Stipagrostis lutescens* (Nees) De Winter var. *marlothii* (Hack.) De Winter**

(=*Aristida marlothii* Hack.) 1.

Leeugras.

Shrub or dwarf shrub; rhizomatous (rhizomes long, strong and branched; culms branched and fascicled in lower part); to



1500 mm tall. Leaf blades rigid, to 150 mm long (usually shorter); 2–3 mm wide (flat). Spikelets 12–14 mm long (excluding awns). Plants robust in the upper parts; culm nodes bearded with long spreading hairs; leaves mainly cauline, rigid, usually held at 90 degree angles from the culm, relatively short, flat or folded, distinctly pungent; inflorescence open, hairy in axils of branches; glumes 8–14 mm long, glabrous; lemma articulation between the apex of the

lemma and the base of the column; column well developed, glabrous or with occasional hairs; all three awns or only the central awn plumose, hairs long, silvery; callus 2.0–2.5 mm long, narrow, with naked, pungent tip.

Flowering throughout the year. Locally common. Biome: Desert. Endemic. Differs from var. *lutescens*, which has glabrous nodes and no hairs in the axils of the inflorescence branches.

Description: De Winter (334). Voucher: De Winter & Hardy 7891. PRECIS code 9902611–02100.

Stipagrostis namaquensis (Nees) De Winter

(=*Aristida namaquensis*
(Nees) Trin. & Rupr.) 1.

Steekrietboesmangras, river
bushman grass.

Fig. 208.



Robust to slender shrub or dwarf shrub; rhizomatous (rhizomes long and strong), or tufted (densely, sprawling to erect); to 2000 mm tall. Leaf blades 60–100 mm long; setaceous. Spikelets 10–14 mm long (excluding awns). Plants glabrous and smooth, except for upper and basal leaf sheaths, which are appressed woolly-hairy; culm branches usually fasciated from the nodes, rarely solitary; leaf blades break off early, leaving the sheaths, and exposing the upper part of the internode, which is usually dark, giving it the characteristic banded appearance; inflorescence elongate, narrow, interrupted, with spikelets clustered; spikelets 15–30 mm long, including the awns; glumes straw-coloured; upper glume 10–14 mm long; lemma articulation at about the middle of the lemma, a short, twisted beak present; all three awns plumose; callus 1.5 mm long, with naked, pungent tip.

Flowering February to May and July to December. Dry river courses, on loose gravelly soils, rarely on sand dunes. Locally common. Biome: Savanna, Nama-Karoo, Succulent Karoo, and Desert. Endemic. Drought resistant pasture (grazed by karakul), or erosion control (sand binder and silt catcher). Hybridizes with *S. brevifolia* (De Winter 3266). Similar to *S. amabilis*, which has only the central awn plumose and longer, less pungent leaves.

Description: De Winter 1965 (325), Stapf 1898–1900 (566), Chippindall 1955 (298). Illustration: Muller 1984 (fig. 127), Chippindall 1955 (fig. 264). Voucher: Ward 254, Smook 4488. PRECIS code 9902611–02200.

Stipagrostis namibensis De Winter

Annual; tufted (sprawling and lax); to 300 mm tall (usually smaller). Leaf blades scabrid, to 30 mm long; to 1 mm wide (flat or slightly folded). Spikelets 8–9 mm long (excluding awns). Leaves mainly basal; inflorescence narrow but open (main axis visible), much branched; glumes firm, glabrous, apex membranous; lemma granular, especially around the articulation, articulation between the apex of the lemma and the base of the column; column length variable, hairy, with hairs shorter than 1.5 mm; only the central awn plumose; callus 1.0–1.6 mm long, with naked, pungent tip.

Flowering March to June. In depressions where water collects, on sandy and gravel plains. Locally common. Biome: Desert. Endemic, or possibly also in Angola.

Description: De Winter 1965 (370). Voucher: Giess, Volk & Bleissner 5739. PRECIS code 9902611–02300.



Fig. 208. *Stipagrostis namaquensis*

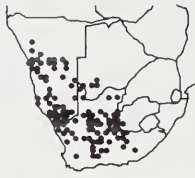
***Stipagrostis obtusa* (Del.) Nees**(=*Aristida obtusa* Del.) 1.

Kortbeenboesmangras.

Compact and densely tufted; to 600 mm tall. Leaf blades 10–250 mm long; to 1 mm wide. Spikelets 11–12 mm long (excluding awns). Basal sheaths may be glabrous or hairy, but not with densely matted, woolly hairs; leaves markedly basal, often curved, glabrous or with scattered long bulbous-based hairs; inflorescence usually contracted, interrupted, much branched, branches bearing spikelets to near the base; glumes pallid, firm, with membranous apices and margins, glabrous, scabrid; lemma articulation between the apex of the lemma and the base of the column; column length variable, scabrid to and at the branching point of the awns; only the central awn plumose; callus 1.5 mm long, with a naked tip varying from pungent to minutely bifid.

Flowering July to May. Mainly sandy soils in dry areas. Common. Biome: Savanna, Nama-Karoo, Succulent Karoo

Fig. 209.

Fig. 209. *Stipagrostis obtusa*

and Desert. Disjunct distribution, also in North Africa, Sinai Peninsula and Iraq to Pakistan. Pasture (good fodder), or erosion control (sand binder).

Description: De Winter 1965 (355), Stapf 1898–1900 (567). Illustration: Chippindall 1955 (fig. 269). Voucher: Smook 4515, Oliver, Muller & Steenkamp 6615, Skarpe 5240. PRECIS code 9902611–02400.

***Stipagrostis proxima* (Steud.) De Winter**(=*Aristida proxima* Steud.) 1.

Shrub or dwarf shrub; long rhizomatous and tufted (erect); to 600 mm tall. Leaf blades to 100 mm long (usually less); setaceous, rolled. Spikelets 8–9 mm long (excluding awns). Culms and leaves with dense appressed hairs in the grooves, hairs becoming more dense, longer and more obvious below the nodes; inflorescence narrow, branches densely hairy, hairs longer and thicker on swollen part just below spikelet; spikelets to 14 mm long (including the awns); glumes firm, acute; upper glume 7–9 mm long; lemma articulation about in the middle of the lemma; column short and stout; all three awns plumose down to branching point and just below on the column; callus 1.5–2.0 mm long, narrow, very short pungent tip.

Flowering November. Sandy soils in disturbed areas. Rare. Infrequent. Biome: Nama-Karoo. Endemic.

Description: De Winter 1965 (322), Stapf 1898–1900 (566), Chippindall 1955 (297). Voucher: Vorster 85, Flanagan 1657. PRECIS code 9902611–02500.

***Stipagrostis ramulosa* De Winter**

Slender perennial; densely tufted; 400–600 mm tall. Leaf blades to 110 mm long. Spikelets to 9 mm long (excluding awns). Plants delicate; culms slender, to 1.2 mm wide, fasciated from the nodes; leaves pungent, erect, usually overtopping the inflorescence, lower surface rough, densely covered with appressed prickles; inflorescence elongate, narrow, sparsely branched with a few spikelets; upper glume 7–9 mm long; lemma articulation near the apex of the lemma; column very short; all three awns plumose to the branching point of the awns, apices not plumose; callus 2 mm long, narrow, with a naked pungent tip.

Flowering November, January, and April. Sandy soils between small dunes, in river beds, near water. Infrequent. Biome: Nama-Karoo. Endemic. Pasture (grazed by game).

Description: De Winter 1965 (333). Voucher: Giess, Volk & Bleissner 6294, sheet 1 & 2. PRECIS code 9902611–02600.

***Stipagrostis sabulicola* (Pilg.) De Winter**(=*Aristida sabulicola* Pilg.) 1.

Namib dune bushman grass.

Reed-like shrub or dwarf shrub; rhizomatous (rhizomes robust and much branched), or tufted (lax to densely); to 2000 mm tall. Leaf blades 250–600 mm long; to 3 mm wide (folded). Spikelets 8–14 mm long (excluding awns). Culms 1.2–5.0 mm wide, fasciculately branched from the nodes; leaves erect, straight, rigid, pungent, overtopping the inflorescence; inflorescence elongate, narrow, spike-like, dense, usually partly enclosed in the uppermost leaf sheath;



glumes straw-coloured, turning brown with age; lemma articulation near apex of lemma; column short and stout; all three awns plumose down to and around the branching point, equal to subequal; callus 1.5–2.0 mm long, tip pungent but barely naked.

Flowering December to January. Dunetops, sandy gullies and river beds. Locally common. Biome: Desert and Succulent Karoo. Endemic. Domestic use (said to be plaited into mats to cover huts).

Description: De Winter 1965 (331). Voucher: Coetzee & Werger 1791a, Giess & Robinson 13233. PRECIS code 9902611–02700.

Stipagrostis schaeferi (Mez) De Winter

(= *Aristida schaeferi* Mez var. *biseriata* Henr.) 1; (= *Aristida schaeferi* Mez var. *schaeferi*) 1.

Woolly leaved bushman grass.

Perennial; densely tufted (cushion-forming), or rhizomatous (rhizomes short, knotty); to 700 mm tall. Leaf blades to 100 mm long (basal leaves shorter than cauline leaves); to 2 mm wide. Spikelets 12–15 mm long (excluding awns). Culm nodes glabrous; basal and young sheaths usually woolly; leaves mainly basal; inflorescence narrow or open but pedicels always flexuous; glumes firm, lower glume narrowly oblong to oblong, apex obtuse to truncate, firm, glabrous or with rigid hairs; lemma articulation near middle of lemma; column well developed, scabrid; only the central awn plumose, hairs often yellowish; callus 2 mm long, with a pungent, naked tip.

Flowering August to November, and March to June. Gravelly soils in hollows in rocky outcrops, on gravel plains and along dry watercourses. Locally common. Biome: Nama-Karoo, Succulent Karoo and Desert. Endemic. Allied to the more common and widespread *S. ciliata* var. *capensis*, which has long spreading hairs at the nodes.

Description: De Winter 1965 (318). Voucher: Giess & Van Vuuren 662. PRECIS code 9902611–02800.

Stipagrostis subacaulis (Nees) De Winter

(= *Aristida subacaulis* Nees ex Steud.) 1.

Stemless bushman grass.

Annual; compactly tufted (to prostrate and spreading); to 100 mm tall. Leaf blades to 30 mm long; to 1 mm wide. Spikelets 15–16 mm long (excluding awns). Culms short, very poorly developed; leaves mainly basal; inflorescence contracted, dense, much branched, main axis not visible; glumes glabrous; lemma articulation between the apex of the lemma and the base of the column; column very long, glabrous or sometimes with a few scattered hairs shorter than 1.5 mm; only central awn plumose; callus 0.8–1.0 mm long, with a naked, pungent tip.

Flowering January to November. Coarse sandy soils on stony hillsides, and depressions on gravel flats, often in soils with gypsum. Locally common. Biome: Succulent Karoo and Desert. Northwards to southern Angola. Closely allied to and often occurring with *S. hermannii*, which has the column densely hairy on swollen area at branching point of awns, and the callus 1.5 mm long.

Description: De Winter 1965 (373), Stapf 1898–1900 (568). Illustration: Chippindall 1955 (fig. 267). Voucher: Giess 7844. PRECIS code 9902611–02900.

Stipagrostis uniplumis (Licht.) De Winter var. *intermedia* (Schweick.) De Winter

(= *Aristida gracilior* Pilg. var. *intermedia* Schweick.) 1.

Annual; tufted; to 600 mm tall. Leaf blades 100–200 mm long; to 1 mm wide (flat or folded). Spikelets 8–10 mm long (excluding awns). Culms conspicuously striate; leaves mainly basal; inflorescence dense, branches long and flexuous; glumes hairy, apex membranous; lemma densely tuberculate around point of articulation, lemma articulation between the apex of the lemma and the base of the column; column well developed, long spreading hairs from branching point down for a variable distance; central awn distinctly plumose except in the lower 1/3; callus 0.5–1.5 mm long, with long hairs at the junction between the lemma and the callus and short hairs for the rest of its length, with a naked, pungent tip.

Flowering March to June (rain dependent). Depressions where water collects, on sandy and gravel plains. Infrequent to common. Biome: Nama-Karoo and Desert. Endemic, or possibly also in southern Angola. Somewhat intermediate between *S. uniplumis*, which has a callus with short hairs over the entire length, and *S. hirtigluma*, which has hairy glumes and a distinct glabrous break between the short hairs along the length of the callus and the long hairs at the junction of the lemma and the callus. There are a number of specimens that have been referred to as *S. uniplumis* X *S. hirtigluma*, which are perennial, have hairy glumes and a callus of the *uniplumis* type. De Winter (1963) refers to these specimens as hybrids between *S. uniplumis* var. *neesii* and *S. hirtigluma* subsp. *patula*.

Description: De Winter 1965 (359). Voucher: De Winter & Hardy 8160, Giess 7848. PRECIS code 9902611–03000.

Stipagrostis uniplumis (Licht.) De Winter var. *neesii* (Trin. & Rupr.) De Winter

Pl. 189.

(= *Aristida uniplumis* Licht. var. *neesii* Trin. & Rupr.) 1.

Perennial; laxly tufted (erect), or rhizomatous (rhizomes short and branched); to 900 mm tall. Leaf blades to 160 mm long; setaceous. Spikelets 10.0–14.5 mm long (excluding awns). Leaves mainly basal; inflorescence narrow; spikelets few; glumes 10 mm or longer, glabrous; lemma tuberculate just below the articulation point, articulation between the apex of the lemma and the base of the column; column well developed and plumed for the upper half of its length, with hairs longer than 1.5 mm; only the central awn plumose, usually hairy to the branching point but not the apex, diverging at right angles from the column; callus 1.0–1.5 mm long, with short hairs along the entire length and long hairs at the junction of the lemma and the callus, with a naked, pungent tip.

Flowering December to May. Mainly gravel soils, sometimes sandy soils on dolomite or over surface limestone, and rocky slopes. Locally common. Biome: Savanna. Endemic. Pasture (good grazing). Grades into var. *uniplumis*, which has more spikelets in the panicle, shorter glumes and a straight central awn. Specimens with hairy glumes have been referred to as hybrids between this var. and *S. hirtigluma* subsp. *patula*.

Description: De Winter 1965 (358). Voucher: De Winter 793, Scheepers 1516. PRECIS code 9902611–03100.



Stipagrostis uniplumis* (Licht.) De Winter var. *uniplumis

Fig. 206.

(=*Aristida uniplumis* Licht.
var. *pearsonii* Henr.) 1;
(=*Aristida uniplumis* Licht. var.
uniplumis) 1.

Silky bushman grass, blink-
aarboesmangras.



Perennial (to subperennial); densely to laxly tufted (erect to geniculate); to 900 mm tall. Leaf blades to 200 mm long; setaceous to 2 mm wide. Spikelets 8–10 mm long (excluding awns). Culms simple or branched well above the base; leaves mainly basal; inflorescence narrow or effuse with many spikelets; glumes usually shorter than 10 mm, glabrous; lemma tuberculate around point of articulation, articulation between the apex of the lemma and the base of the column; column well developed, plumed in the upper half, with hairs longer than 1.5 mm; only the central awn plumose with hairs occurring to 1/3 above or down to the branching point of the awns, apex without hairs; callus 0.5–1.2 mm long, with short hairs along the entire length and long hairs at the junction of the lemma and the callus, with a pungent, naked tip.

Flowering December to May. Usually on sandy soils and disturbed areas and floodplains. Common. Biome: Savanna, Nama-Karoo, and Desert. Zimbabwe, Angola, Uganda, Somalia to Senegal. Valuable pasture. A variable taxon, which grades into var. *neesii*, which has a panicle with fewer spikelets. Hybridizes with *S. hirtigluma* (De Winter 5710).

Description: Chippindall & Crook 1976 (56), De Winter 1965 (359), Stapf 1898–1900 (569). Illustration: Muller 1985 (fig. 129). Voucher: Acocks 1938. PRECIS code 9902611–03200.

***Stipagrostis zeyheri* (Nees) De Winter subsp. *barbata* (Stapf) De Winter**

(=*Aristida capensis* Thunb.
var. *barbata* Stapf) 1.

Cape bushman grass.



Robust perennial; densely tufted (erect), or rhizomatous (rhizomes short and knotty); to 900 mm tall. Leaf blades to 500 mm long; setaceous. Spikelets 16–18 mm long (excluding awns). Culms 1.2–5.0 mm wide; leaf blades flaccid, often curling, almost overtopping the inflorescence; inflorescence contracted and dense; glumes glabrous, pallid, slightly darker at the base; lemma articulation between the apex of the lemma and the base of the column; column with long hairs below the branching point of the awns; all three awns plumose to the branching point and excurrent into a long naked apex; callus 2.0–2.5 mm long, with a distinct naked tip.

Flowering January to May (and July, October and November). Coastal dunes. Locally common. Biome: Fynbos and Savanna. Endemic. Not well differentiated from subsp. *zeyheri*, which is apparently limited to the winter rainfall area.

Description: De Winter 1965 (346), Stapf 1898–1900 (565). Voucher: Acocks 13588, Smook 1862. PRECIS code 9902611–03300.



Fig. 210. *Stipagrostis zeyheri* subsp. *sericans*

***Stipagrostis zeyheri* (Nees) De Winter subsp. *macropus* (Nees) De Winter**

(=*Aristida capensis* Thunb. var. *genuina* Henr.) 1;
(=*Aristida capensis* Thunb. var. *macropus* (Nees) Trin. & Rupr.) 1; (= *Aristida capensis*) Thunb., non *Stipagrostis capensis* Nees) 1.



Bushman grass.

Robust perennial; shortly rhizomatous; to 720 mm tall. Leaf blades to 200 mm long; setaceous. Spikelets 17–18 mm long (excluding awns). Culms 1.2–5.0 mm wide; leaves mainly basal; inflorescence open, divaricate, with spikelets at end of the branches; glumes usually dark, longer than 15 mm, glabrous; lemma articulation between the apex of the lemma and the base of the column; column smooth, glabrous; all three awns plumose to the branching point and excurrent into a naked apex, hairs dirty-white to golden; callus 2.0–2.5 mm long, with a distinct, naked, pungent tip.

Flowering August to November. Sandy soils and old cultivated lands. Locally common. Biome: Fynbos and Succulent Karoo. Endemic. Reported to hybridize with *S. ciliata* var. *capensis* (Acocks 14817). This hybrid was assigned the name *Aristida schlechteri* by Henrard, but was not accepted by De Winter.

Description: De Winter 1965 (346), Stapf 1898–1900 (565). Voucher: Davidge 33311, Van Breda 775. PRECIS code 9902611–03400.

***Stipagrostis zeyheri* (Nees) De Winter subsp. *sericans* (Hack.) De Winter**

(=*Aristida capensis* Thunb. var. *dieterleniana* Schweick.) 1;
(=*Aristida sericans* Hack. apud Schinz) 1.



Fig. 210.

Robust perennial; densely tufted (erect); to 750 mm tall. Leaf blades to 300 mm long; setaceous, rolled. Spikelets to 14 mm long (excluding awns). Culms 1.2–5.0 mm wide; inflorescence extending well above the leaves, usually narrow, never effuse, with few spikelets; glumes pallid, long hairy; lemma articulation at the apex of the lemma or absent; column stout, with long hairs for some distance below the branching point; all three awns plumose to the branching point of the awns, excurrent into a naked apex; callus 1.0–1.5 mm long, naked, with a pungent tip.

Flowering January to May. Sandy soils on rocky outcrops and disturbed areas such as old lands. Infrequent to locally common. Biome: Savanna and Grassland. Endemic.

Description: De Winter 1965 (346 & 349). Voucher: Smook 6358, Ferreira F213. PRECIS code 9902611–03500.

***Stipagrostis zeyheri* (Nees) De Winter subsp. *zeyheri* (Pl. 190.**

(=*Aristida capensis* Thunb. var. *canescens* Trin. & Rupr.) 1.



Robust perennial; shortly rhizomatous (knotty), tufted (erect); to 750 mm tall. Leaf blades to 500 mm long; setaceous, folded. Spikelets 16–19 mm long (excluding awns). Culms 1.2–5.0 mm wide; leaves erect and rigid; inflorescence open, divaricate, branches and pedicels flexuous with the spikelets at the end of the branches; glumes glabrous; lemma articulation between the apex of the lemma and the base of the column; column long-hairy; all three awns plumose to the branching point of the awns, excurrent into a naked

apex; callus 2 mm long, with a naked, pungent tip.

Flowering October to March (and May and July). Sandy slopes and limestone hills, disturbed areas, especially on recently burnt areas. Locally common. Biome: Fynbos. Endemic. Not well differentiated from subsp. *barbata*, which is common along the east coast of the Cape.

Description: Stapf 1898–1900 (563). Voucher: Taylor 5602. PRECIS code 9902611–03600.

***Streblochaete* Pilg.**

Koordersiochloa Merr., *Pseudostreptogyne* A. Camus.

Perennial; caespitose. Culms 300–1000 mm high; herbaceous; unbranched above. *Sheath margins joined. Leaf blades linear-lanceolate*; rolled. *Ligule an unfringed membrane*.

Inflorescence paniculate; open; espatheate. Spikelet-bearing axes persistent.

Spikelets 16–28 mm long; *not noticeably compressed*; disarticulating above the glumes. Glumes present; two; very unequal; markedly shorter than the spikelets; awnless; similar (narrow, membranous-herbaceous with hyaline margins). Incomplete florets distal to the female-fertile florets, merely underdeveloped (male or sterile); proximal incomplete florets absent.

Female-fertile florets 2–6. Lemmas similar in texture to the glumes to decidedly firmer than the glumes; 7 nerved; incised (shortly so, to nearly entire); awned. Awns 1; median; dorsal; geniculate (the very long awns intertwine, so that the spikelet is dispersed as a unit); much longer than the body of the lemma (distally filiform). Palea present;



S.E.

Fig. 211. *Streblochaete longiarista*

conspicuous but relatively short (about half the lemma length). Lodicules 2; membranous; ciliate, or glabrous. Stamens 3. Ovary glabrous; hilum short; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Poideae; Poodae; Meliceae. 1 species. Tropical Africa, Java, Lombok, Philippines. Montane. Mesophytic; in shade; glycophytic. Natal and Cape Province. 1 indigenous species.

References. 1. Clayton. 1970. FTEA.

Species treatment by G.E. Gibbs Russell.

Streblochaeta longiarista (A. Rich.) Pilg.

Fig. 211. Pl. 191.

Perennial; loosely tufted; 300–900 mm tall. Leaf blades to 250 mm long; 3–11 mm wide (narrowed towards base). Leaf sheaths tubular; callus sharp, 2–3 mm long, with dense short white hairs; lemma with a fine twisted awn, to 40 mm long, that tangles with other awns in the panicle.

Flowering April to May. Open places in mountain forests. Rare. Biome: Forest. Through east African highlands to Ethiopia, also Reunion, Java and the Philippines. Apparently very dissimilar from its relative, *Melica*, but classified in the same tribe because of lodicule and chromosome similarities.

Description: Chippindall 1955 (82). Clayton et al. 1970–1982 (74). Illustration: Chippindall 1955 (fig. 53). Clayton et al. 1970–1982 (fig. 25). Voucher: Chippindall 356. PRECIS code 9901971–00100.

Styppeiochloa De Winter

Sometimes included in *Crinipes* Hochst.

Perennial; densely caespitose (the hard, fibrous basal sheaths forming tough, fire-resistant mats). Culms 100–700 mm high; herbaceous; unbranched above (wiry, the nodes hidden at the base). *Leaf blades* linear; to 1 mm wide; setaceous (resembling the culms); rolled (convolute). *Ligule* a fringe of hairs.

Inflorescence paniculate; contracted (scanty, the spikelets appressed to the panicle branches); espatheate. Spikelet-bearing axes persistent.

Spikelets compressed laterally; disarticulating above the glumes. *Callus* short. *Hairy callus* present. Glumes two; very unequal, or more or less equal; markedly shorter than the spikelets; short awned (or aristate from the excurrent mid-nerve), or awnless; similar (lanceolate, apices 3-lobed or acute/entire). Incomplete florets distal to the female-fertile florets, merely underdeveloped, awned, or awnless; proximal incomplete florets absent.

Female-fertile florets 2–5. Lemmas similar in texture to the glumes (membranous); hairy (at margins, near base); without a germination flap; 3–5 (–7) nerved; incised; mucronate to awned (the three lobes with awns or mucros). *Awns*, when present, 3; median, or median and lateral (via shortly excurrent nerves). *The median awn* similar in form to the laterals (when laterals present); *apical*; non-geniculate; much shorter than the body of the lemma. Palea present (narrowly lanceolate); relatively long (equalling the lemma); 2-nerved. Stamens 3. Ovary glabrous. Fruit small (about 2 mm long); fusiform; hilum long-linear; embryo small.

Photosynthetic pathway. C_3 ; $XyMS+$.

Cytology, classification, distribution. Arundinoideae; Danthonieae. 2 species. South and southeastern tropical African mountains. Helophytic to mesophytic; in open habitats (where there is impeded drainage, in mountains); glycophytic. Transvaal, Orange Free State, Natal, and Cape Province. 1 indigenous species.

References. 1. De Winter. 1966. *Bothalia* 9: 134.

Species treatment by N.P. Barker.

Styppeiochloa gynoglossa (Goossens) De Winter

Fig. 212. Pl. 192.

(=*Crinipes gynoglossa* Goossens) 1.



Perennial; mat forming to tufted; 100–700 mm tall. Leaf blades 100–400 mm long; to 1.2 mm wide. Spikelets 5–7 mm long. Sheaths and leaves split with age, forming a dense, fibrous base; spikelets 2–5-flowered, the uppermost floret sterile or reduced; glumes 1–3-nerved, unequal, 3 central nerves produced into a short awn; lemmas basally pubescent with trilobed apex, 3–5 (–7)-nerved, with middle lobe extending into a short awn.



Fig. 212. *Styppeiochloa gynoglossa*

Flowering September to January (and even later to the north). Rock crevices and seepage areas over rocks; high rainfall areas (800 mm or more) at high altitudes. Locally dominant (in seepage areas). Biome: Afromontane. Zimbabwe and southern Mozambique at altitudes as low as 610 m. Chippindall (1955) distinguishes a distinct variety from the Natal Drakensberg. These specimens apparently have larger spikelets and almost glabrous lemmas.

Description: De Winter 1966 (135). Goossens 1934 Kew Bull. (200). Chippindall 1955 (123–124). Illustration: Goossens 1934 Kew Bull. (200). Chippindall 1955 (fig. 96). Voucher: Ellis 3288. PRECIS code 9903504–00100.

Tarigidia Stent

Perennial (glaucous); caespitose. Culms 800–1500 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat (margins thickened). *Ligule an unfringed membrane. Plants bisexual, with bisexual spikelets.* The spikelets of sexually distinct forms on the same plant (in that some spikelets at the raceme bases may be sterile), or all alike in sexuality.

Inflorescence paniculate; contracted; espatheate. Spikelet-bearing axes disarticulating (at least the lower branches do so); falling entire.

Spikelets clustered or in pairs on lower panicle branches. Female fertile spikelets 4–4.5 mm long; abaxial; compressed dorsiventrally; falling with the glumes. Glumes two; very unequal (G1 sometimes much reduced), or more or less equal (usually); awnless. *Proximal incomplete florets 1; epaleate; sterile.*

Female-fertile florets 1. Lemmas similar in texture to the glumes; not becoming indurated; hairless; having the margins lying flat and exposed on the palea; without a ger-

mination flap; entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous.

Photosynthetic pathway. C₄; XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Panicoideae; Panicoideae; Paniceae. 1 species. Southern Africa. Mesophytic to xerophytic; in open habitats (dry grassland); glycophytic. Namibia, Transvaal, Orange Free State, and Cape Province. 1 indigenous species.

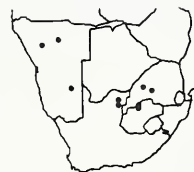
References. 1. Chippindall. 1955. Gr. & Past. 2. Launert. 1970. FSWA.

Species treatment by G.E. Gibbs Russell.

Tarigidia aequiglumis (Goossens) Stent

Fig. 213. Pl. 193.

Perennial; densely tufted; 800–1500 mm tall. Leaf blades to 350 mm long; 3–5 mm wide. Spikelets 4.0–4.5 mm long. Inflorescence spike-like or narrowly conical, with short branches appressed or somewhat spreading below; spikelets woolly; glumes equal, about 2/3 of spikelet length.



Flowering January to May. Open veld or among rocks. Rare. Biome: Savanna and Grassland. Endemic. Similar in general appearance to *Antheophora*, which does not have inflorescence branches, and the spikelets are similar to *Digitaria*, which has very small lower glumes and the upper glumes less than 1/4 the spikelet length.

Description: Chippindall 1955 (422). Voucher: Dinter 5589. PRECIS code 9900891–00100.

Tetrachne Nees

Perennial; forming large tufts, the shoots crowded on a short, oblique rhizome. Culms 300–1000 mm high; herbaceous; branched above to unbranched above. Leaf blades linear; usually rolled. Ligule a fringe of hairs (dense).

Inflorescence of spike-like main branches (the few to many branches appressed, short, dense); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate (on one side of rachis, crowded); 4–6 mm long; compressed laterally; falling with the glumes; not disarticulating between the florets. Glumes two; more or less equal; decidedly shorter than the adjacent lemmas; awnless; the keels somewhat winged; similar (thin, acute, the lower smaller). Incomplete florets both distal and proximal to the female-fertile florets; distal florets merely underdeveloped, awnless; *proximal incomplete florets 2.*

Female-fertile florets 3–5. Lemmas similar in texture to the glumes; without a germination flap; 5 nerved; entire; awnless. Palea present; relatively long (equalling the lemma). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (2.5 mm long); fusiform; hilum short; pericarp fused, or loosely adherent (removable with difficulty after soaking); embryo large (about 2/3 the length of the fruit).

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines fairly even. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chloridoideae *sensu lato*. 1 species. South Africa and Pakistan. Mesophytic (often in alluvial soil); in open habitats (in high altitude grassland); glycophytic. Orange Free State, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by M. Koekemoer.



Fig. 213. *Tarigidia aequiglumis*

***Tetrachne dregei* Nees**

Robies cocksfoot, kropaar-gras.

Perennial; rhizomatous and tufted; 320–860 mm tall. Leaf blades 50–125 mm long; to 1 mm wide. Spikelets 4–6 mm long. Base robust or woody; culms branching freely; leaves curly; spikes more than 4, stout, 10–40 mm long, not spreading far from the central axis, more or less their own length apart.

Flowering November to March. Sandy soil on riverbanks, rocky outcrops or mountain slopes, at altitudes higher than 1250 m. Infrequent to locally common. Biome: Grassland and Nama-Karoo. Pakistan. Pasture (mostly in natural veld but also cultivated on small scale, semi-procumbent and forming dense stands when grazed).

Fig. 214. Pl. 194.

Fig. 214. *Tetrachne dregei*

Description: Stapf 1898–1900 (710), Chippindall 1955 (188). Illustration: Chippindall 1955 (fig. 164). Voucher: Smook & Gibbs Russell 2186. PRECIS code 9903270–00100.

***Tetrapogon* Desf.**

Codonachne Steud., *Cryptochloris* Benth., *Lepidopironia* A. Rich.

Annual, or perennial; long-stoloniferous, or caespitose. Culms 130–850 mm high; herbaceous. Leaf blades linear (tapered); folded (usually). *Ligule a fringed membrane (very narrow)*.

Inflorescence a single spike, or of spike-like main branches (1–3 upright racemes or spikes, of which 2 may be partly or completely fused along their backs); digitate or subdigitate, or non-digitate; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary, or in pairs; secund (the rachis one-sided); biseriate; sessile; 2.5–12 mm long (cuneate); compressed laterally; disarticulating above the glumes (the glumes persistent); not disarticulating between the florets, or disarticulating between the florets (but under the fertile florets only). Hairy callus present. Glumes two; relatively large; more or less equal; long relative to the adjacent lemmas; awned (awn-tipped), or awnless; similar (lanceolate, long-pointed, subhyaline). Incomplete florets distal to the female-fertile florets (1 — several, awned); proximal incomplete florets absent.

Female-fertile florets 2–7. Lemmas decidedly firmer than the glumes (herbaceous, leathery, the margins hyaline); 3–5 nerved; entire (truncate), or incised; awned. Awns 1; median; dorsal; non-geniculate; much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (1.5–3 mm); ellipsoid; hilum short; pericarp free; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 5–6 species. Mediterranean to India, tropical and South Africa. Helophytic to mesophytic; in shade, or in open habitats (savanna); glycophytic. Namibia and Transvaal. 1 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

***Tetrapogon tenellus* (Roxb.) Chiov.**

Fig. 215. Pl. 195.

Shortlived perennial, or annual; loosely tufted (culms erect or ascending); 130–750 mm tall. Leaf blades 100–240 mm long; 2–4 mm wide. Spikelets 3.5–5.0 mm long. Spikes solitary (seldom paired); spikelets 5–6-flowered; glumes persistent, 3–5 mm long; lemma coriaceous, 4.0–6.5 mm long, keeled; awns 3–11 mm long.

Flowering January to April. Usually in the shade in open or dense bushveld, often in disturbed rocky soil and on limestone. Infrequent. Biome: Savanna. Eastern Africa to India.

Description: Chippindall 1955 (198), Clayton et al. 1970–1982 (348). Voucher: Van der Schijff 5204. PRECIS code 9903220–00200.



Fig. 215. *Tetrapogon tenellus*

Thamnocalamus Munro
Himalayacalamus Keng f.

Perennial; caespitose. Culms 1000–5000 mm high; woody and persistent. Culms reaching 20 mm in diameter; culms branched above. Leaf blades pseudopetiolate. Ligule a fringed membrane.

Inflorescence a single raceme, or panicle; contracted; spatheate.

Spikelets solitary; 15–18 mm long; not noticeably compressed. Glumes two; more or less equal; long relative to the adjacent lemmas; awnless (upper glume pointed); similar. Proximal incomplete florets absent.

Female-fertile florets 2–8. Lemmas entire; awnless, or mucronate (?); 10–11 nerved. Palea present; relatively long; with several nerves. Lodicules 3; membranous; ciliate. Stamens 3. Ovary glabrous; stigmas 3.

Transverse section of leaf blade. Mesophyll with arm cells; with fusoids. Midrib usually with one bundle only (complex in *T. aristatus*).

Cytology, classification, distribution. Chromosome base number, $x = 12$. Bambusoideae; Bambusodae; Bambuseae. 6 species. Eastern Asia, South Africa. Helophytic, or mesophytic; glycophytic. Orange Free State, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Soderstrom & Ellis. 1982. *Bothalia* 14: 53.

Species treatment by G.E. Gibbs Russell.

Fig. 216. *Thamnocalamus tessellatus*

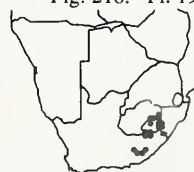
Thamnocalamus tessellatus (Nees) Soderstrom & Ellis

(= *Arundinaria tessellata*
(Nees) Munro) 1.

Fig. 216. Pl. 196.

Bamboo; rhizomatous (rhizomes stout, woody); 1000–5000 mm tall (culms to 20 mm in diameter, profusely branched above). Leaf blades 50–150 mm long; 8–15 mm wide. Spikelets 16–18 mm long. Leaf blades with conspicuous cross-veins.

Flowering in local populations after many years, followed by death. Mountainsides, in wet places and



sheltered ravines, 1600–2700 m. Locally common. Biome: Afromontane. Endemic.

Description: Chippindall 1955 (30), Soderstrom & Ellis. 1982. (53). Illustration: Chippindall 1955 (fig. 1), Soderstrom & Ellis. 1982. (fig. 1 & 2). Voucher: Soderstrom & Du Toit 1610. PRECIS code 9904570–00100.

Thelepogon Roth.

Rhinachne Steud..

Annual (rather stout, erect or decumbent, often with prop roots). Culms 100–1500 mm high; herbaceous; branched above, or unbranched above. Leaf blades lanceolate (from the amplexicaul base); cordate; flat. Ligule an unfringed membrane, or a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (hermaphrodite/sterile, but the latter reduced to their pedicels).

Inflorescence of spike-like main branches (of long, brittle golden 'racemes'); digitate or subdigitate (on a short common axis); spatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (with numerous spikelets); clustered; with substantial rachides; disarticulating at the joints. 'Articles' without a basal callus-knob.

Spikelets in pairs (but the pedicellate one reduced to the pedicel); consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis (the pedicel and joint separated below, contiguous above). The sessile spikelets hermaphrodite. The pedicellate spikelets sterile (reduced to the pedicels). Female-fertile spikelets 5–13 mm long; compressed dorsiventrally; falling with the glumes (deciduous with joint and sterile pedicel). Hairy callus present (callus annular, short, ciliate). Glumes two; more or less equal; awnless; very dissimilar. Lower glume not two-keeled. Proximal incomplete florets 1; paleate, palea fully developed; male.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); incised; awned. Awns 1; median; from the sinus; geniculate; much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (about 3 mm long); ellipsoid; hilum short; embryo large (about half the length of the fruit).

Cytology, classification, distribution. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 1 species. Tropical Africa, Asia. Helophytic to mesophytic; in open habitats (seasonally wet, heavy soils and disturbed ground); glycophytic. Namibia. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Thelepogon elegans Roem. & Schult.

Coarse annual; 100–1500 mm tall. Leaf blades 40–200 mm long; 5–30 mm wide (base cordate, clasping). Spikelets (sessile) 5–13 mm long (pedicellate somewhat longer). Lower glume of sessile spikelet prominently rugose.

Flowering May. Black turf soil. Biome: Savanna, Tropical Africa to Indonesia.

Description: Clayton et al. 1970–1982 (744). Illustration: Clayton et al. 1970–1982 (fig. 174). Voucher: Ellis 3742. PRECIS code 9900110–00100.



Fig. 217. Pl. 197.



Fig. 217. *Thelepogon elegans*

Themeda Forssk.

Androscepia Brong., *Anthistiria* L. f., *Aristaria* Jungh., *Heterelytron* Jungh., *Perobachne* Presl.

Annual, or perennial; caespitose (coarse, very rarely stoloniferous). Culms 300–3100 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear; flat, or folded. Ligule an unfringed membrane to a fringed membrane. Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (male or neuter, and hermaphrodite); overtly heteromorphic.

Inflorescence paniculate (leafy, comprising short racemes in spatheate, hard-to-interpret clusters); open; spatheate; a complex of 'partial inflorescences' and intervening foliar organs (composed of short racemes in spatheate clusters; each cluster terminated by 1–3 pairs of spikelets, one of each pair sessile and bisexual, the other pedicellate and male-or-sterile (or a triplet of 1 terminal sessile spikelet with 2 pedicellate ones), the whole surrounded by a whorl of 4 male or sterile, sessile spikelets constituting an involucre). Spikelet-bearing axes very much reduced; clustered (racemes solitary in their spatheoles, these units in groups of three or more in short capituliform glomerules); disarticulating at the joints (racemes disarticulating at the level of the fertile spikelets).

Spikelets associated with bractiform involucre (constituted by the four imperfect spikelets); in pairs and in triplets; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets

male-only, or sterile. Female-fertile spikelets not noticeably compressed to compressed dorsiventrally; falling with the glumes (clusters disarticulate immediately above involucre). Glumes two; more or less equal; awnless; leathery. *Proximal incomplete florets 1*; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline, stipitate beneath the awn); entire (usually); awned. Awns 1; median; apical (usually); geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present, or absent; when present conspicuous but relatively short, or very reduced. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 18 species. Warm Africa, Asia, Australia. Mesophytic; in open habitats (savanna); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA. 2. PRE herbarium practice, following Smook & Gibbs Russell.

Species treatment by G.E. Gibbs Russell & M. Koekemoer.

***Themeda triandra* Forssk.**

Fig. 218. Pl. 198. Pl. 199.

(= *T. triandra* Forssk. var. *burchellii* (Hack.) Stapf) 1; (= *T. triandra* Forssk. var. *hispida* (Nees) Stapf) 1; (= *T. triandra* Forssk. var. *imberbis* (Retz.) A. Camus) 1; (= *T. triandra* Forssk. var. *trachyspatea* Goossens) 1; (= *T. triandra* Forssk. var. *vulgaris* auct., non Hack.) 2.



Rooigras.

Perennial; rhizomatous; 300–1500 mm tall. Leaf blades to 300 mm long; 1–8 mm wide. Spikelets (sessile) 5–7 mm long (pedicellate equalling it or somewhat longer). Leaf sheaths compressed; ligule a notched membrane; blade tips abruptly or gradually tapering; spikelets awned, in drooping triangular clusters with reddish spathes and bractlike sterile spikelets.

Flowering September to June. Undisturbed veld. Widely dominant. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Old World tropics and subtropics. Pasture (natural veld). Although *Themeda triandra* is extremely variable, the characters used to separate the traditional varieties are poorly correlated with other attributes such as distribution, habitat and chromosome number. Some forms may vegetatively resemble *Heteropogon contortus*, which has an undivided ligule and blunt often hooded leaf blades, or *Schizachyrium sanguineum*, which has a strongly curved undivided ligule, abruptly pointed leaf blades, and a reddish colour.

Description: Chippindall 1955 (490), Clayton et al. 1970–1982 (829). Illustration: Chippindall 1955 (pl. 18), Clayton et al. 1970–1982 (fig. 192), Flower. Pl. Afr. (44: 1741). Voucher: De Winter 2748. PRECIS code 9900830–00100.



Fig. 218. *Themeda triandra*

Thinopyrum A. Loeve

Sometimes included in *Elytrigia* Desv. or *Elymus* L.

Perennial (rigid, erect); long-rhizomatous. Culms 250–700 mm high; herbaceous; unbranched above. *The shoots aromatic*. Leaf blades linear (glaucous); rolled (involute). Ligule an unfringed membrane.

Inflorescence a single spike (the spikelets usually appressed); espatheate. Spikelet-bearing axes disarticulating (fragile); disarticulating at the joints (the spikelets falling with the internode below).



Fig. 219. *Thinopyrum distichum*

Spikelets solitary; distichous; compressed laterally; falling with the glumes. Glumes two; more or less equal (subequal); markedly shorter than the spikelets; awnless; similar. Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 2–10. Lemmas similar in texture to the glumes (leathery); 5 nerved; entire; awnless. Palea present; relatively long. Lodicules 2; membranous; ciliate. Stamens 3. Ovary hairy. Fruit medium sized; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Triticoideae; Triticeae. 5 species. Coasts of Europe. Xerophytic; in open habitats; maritime-arenicolous. Cape Province. 1 indigenous species.

Intergeneric hybrids with *Leymus* and *Elytrigia*.

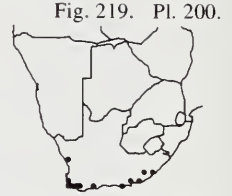
References. 1. Chippindall. 1955. Gr. & Past. 2. Dewey. 1984. Genomic classification in Gustafson, Gene manipulation: 209.

Species treatment by M. Koekemoer.

Thinopyrum distichum (Thunb.) Loeve

(= *Agropyron distichum* (Thunb.) Beauv.) 1.

Strandkoringras, coastal wheat grass.



Hard, robust perennial; stoloniferous (underground parts thick, creeping and profusely rooted at the nodes); 400–600(–900) mm tall. Leaf blades 200–400(–500) mm long; 5–7 mm wide. Spikelets (15–)28–40 mm long. Culms often branched below with tufts of leaves from the nodes; leaves flat at first and then rolled, rigid, sharp pointed; spike 60–250 mm long, rachis breaking up easily; spikelets 5–11-flowered, hard and smooth, arranged alternately, appressed to rachis.

Flowering October to January. On coastal sand dunes, usually in areas exposed to seawinds and saltspray; it can also tolerate inundation by spring tides. Locally common. Endemic. Food and drink (culms chewed by people for juicy sweet sap), or erosion control (efficient sand binder, also used in reclamation work).

Description: Stapf 1898–1900 (743), Chippindall 1955 (69). Illustration: Chippindall 1955 (fig. 41). Voucher: Moffett 3816. PRECIS code 9904348–00200.

Trachypogon Nees

Homopogon Stapf.

Perennial (very rarely annual); caespitose. Culms 300–2000 mm high; herbaceous (with slender culms); unbranched above. Leaf blades linear; usually rolled, or flat (sometimes). *Ligule an unfringed membrane*. *Plants bisexual, with bisexual spikelets. The spikelets of sexually distinct forms on the same plant (hermaphrodite and male or neuter)*; overtly heteromorphic (male or neuter spikelets without callus, awnless); *all in heterogamous combinations*.

Inflorescence of a single raceme (or up to 5 racemes); digitate or subdigitate, or non-digitate; espatheate; not comprising 'partial inflorescences' and foliar organs. *Spikelet-bearing axes 'racemes'* (long, terminating the culms); solitary, or paired, or clustered (up to 5 'racemes'); *persistent (but joints articulated and usually shortly bearded)*.

Spikelets in pairs; consistently in 'long-and-short' combinations (in which, however, the usual pattern of sexuality is inverted); unequally pedicellate in each combination. Pedicels free of the rachis. The short-pedicellate spikelets male-only, or sterile, persistent, sometimes dorsally flattened, without a callus, sometimes awnless, L1 sterile. The long-pedicellate spikelets hermaphrodite. Female-fertile spikelets not noticeably compressed (cylindrical); falling with the glumes (falling from pedicels). Glumes two; relatively large; more or less equal; awnless; very dissimilar (G1 firmer, convolute, 2-keeled; G2 thinner, channelled on each side of the rounded keel). *Proximal incomplete florets 1*; epaleate; sterile.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline basally, but becoming stipitate-cartilaginous above); entire; awned. Awns 1; median; apical; geniculate; much longer than the body of the lemma. Palea present, or absent; when present very reduced. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$, or 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. About 13 species. Tropical America and Africa, Madagascar. Mesophytic; in open habitats (savanna); glycophytic. Namibia, Botswana,

Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell & M. Koekemoer.



Fig. 220. *Trachypogon spicatus*

***Trachypogon spicatus* (L. f.) Kuntze**

(=*T. capensis* (Thunb.) Trin.) l.

Giant spear grass, reuse pyl-gras.

Perennial; rhizomatous and tufted; 300–1200 mm tall. Leaf blades 50–200 mm long; to 5 mm wide. Spikelets (short-pedicellate) 6–8 mm long (long-pedicellate slightly longer). Culm nodes with ring of hairs;



Fig. 220. Pl. 201.

ligule membranous, splitting into three lobes; inflorescence a single raceme (rarely up to 5 racemes) with velvety awns throughout its length.

Flowering October to May. Bushveld and sourveld. Common. Biome: Fynbos, Savanna, and Grassland. Africa and tropical America. *Urelytrum agropyroides* and *Heteropogon contortus* also have large, awned, single-raceme inflorescences, but they lack the hairy culm nodes of *Trachypogon*.

Description: Chippindall 1955 (494), Clayton et al. 1970–1982 (709). Illustration: Chippindall 1955 (Pl. 20), Clayton et al. 1970–1982 (fig. 163), Flower. Pl. Afr. (38: 1512). Voucher: Ward 2778. PRECIS code 9900780–00100.

Tragus Haller

Annual, or perennial; long-stoloniferous, or decumbent (usually creeping). Culms 50–650 mm high; herbaceous. Leaf blades flat. Ligule a fringed membrane (very narrow), or a fringe of hairs. The spikelets of sexually distinct forms on the same plant (with one or more members of the cluster reduced), or all alike in sexuality.

Inflorescence a false spike, with clusters of spikelets on reduced axes (a spicate raceme of crowded glomerules, the latter very shortly- or rarely long- peduncled, with 2–5 spikelets); espatheate. Spikelet-bearing axes disarticulating; falling entire (the clusters falling whole).

Female-fertile spikelets 2–5 mm long; compressed dorsiventrally; falling with the glumes (in the cluster). Hairy callus absent. Glumes one per spikelet, or two; very unequal, or not applicable (G1 much reduced or absent); long relative to the adjacent lemmas (G2 equalling the spikelet); awnless; very dissimilar (lower tiny, scarious or absent, upper large, hard, with 5 rows of hooked spines on the back). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas less firm than the glumes (membranous); 3 nerved; entire; awnless. Palea present. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C₄; XyMS+. PCR sheath outlines even. PCR sheath extensions present. Maximum number of extension cells 1. PCR cell chloroplasts with well developed grana; centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 7 species, 6 in warm Africa, 1 pantropical. Mesophytic to xerophytic; in open habitats (often in disturbed ground); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 4 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Anton. 1981. Kew Bull. 36:55. 3. Clayton et al. 1974. FTEA.

Species treatment by G.E. Gibbs Russell.

- 1(0). Inflorescence appearing branched; peduncles of spikelet clusters about same length as spikelets; upper glume of lowest spikelet in each cluster longer than 6 mm; glume hairs straight, never curved or hooked at tip ***T. pedunculatus***
Inflorescence appearing spike-like; peduncles of spikelet clusters much shorter than spikelets; upper glume of lowest spikelet in each cluster shorter than 5 mm; glume hairs curved or hooked at tip 2
- 2(1). Glume hairs curved, not hooked at tip; plant a stoloniferous perennial; anthers 1.8–2.5 mm long ***T. koelerioides***
Glume hairs hooked at tips; plant annual, culms

- sometimes rooting at lower nodes; anthers less than 1 mm long 3
 3(2). Lowest glumes with 5 nerves; lowest spikelet in each cluster 2.0–3.8 mm long; anthers 0.4–0.6 mm long **T. berteronianus**
 Lowest glumes with 7 nerves; lowest spikelet in each cluster 3.5–5.0 mm long; anthers 0.6–0.8 mm long **T. racemosus**

Tragus berteronianus Schult.

Small carrot-seed grass,
kousklits.

Annual; loosely tufted; 50–600 mm tall. Leaf blades 10–60 mm long; 2–5 mm wide. Spikelets (lowest in each cluster) 2.0–3.8 mm long. Inflorescence narrowly spike-like; spikelets clustered on peduncles that are much shorter than the spike-



Fig. 221. Pl. 202.



Fig. 221. *Tragus berteronianus*

les; lowest glumes 5-nerved, spaces between nerves 2–5 times wider than the nerves (in the middle, tapering sharply at their ends); glume hairs hooked at tips; anthers 0.4–0.6 mm long.

Flowering throughout the year (most commonly in summer). Disturbed places. Common. Biome: Savanna, Grassland, Nama-Karoo, and Desert. Throughout Africa and in Arabia, Afghanistan, China and warm America. Ruderal weed. May be confused with *T. racemosus*, which has larger spikelets and anthers, and 7-nerved glumes.

Description: Chippindall 1955 (107). Clayton et al. 1970–1982 (400). Illustration: Chippindall 1955 (fig. 79). Clayton et al. 1970–1982 (fig. 108). Voucher: Pott 5533. PRECIS code 9902740–00100.

Tragus koelerioides Aschers.

Creeping carrot-seed grass,
kophaargras.

Perennial; rhizomatous and stoloniferous; 120–650 mm tall. Leaf blades 10–50(–80) mm long; to 3 mm wide. Spikelets (lowest in each cluster) 3.5–4.8 mm long. Inflorescence narrowly spike-like; spikelets clustered on peduncles that are much shorter than the spikelets; glume hairs curved, not hooked at the tip; anthers 1.8–2.5 mm long.

Flowering October to May. Open veld, on a variety of soil types. Infrequent. Biome: Savanna, Grassland, and Nama-Karoo. Endemic. Ruderal weed (increases with overgrazing).

Description: Chippindall 1955 (107). Illustration: Chippindall 1955 (fig. 77). Voucher: Smook 3372. PRECIS code 9902740–00200.



Tragus pedunculatus Pilg.

Annual; culms branched above, sometimes decumbent; 100–400 mm tall. Leaf blades 20–60 mm long; about 2 mm wide. Spikelets (lowest in each cluster) 6–10 mm long. Inflorescence appearing branched; spikelets clustered on peduncles about as long as the spikelets; glume hairs straight.

Flowering January to April. Shallow sand over limestone. Conservation status not known. Biome: Savanna. Endemic.

Description: Chippindall 1955 (107). Voucher: Dinter 5698. PRECIS code 9902740–00300.



Tragus racemosus (L.) All.

Large carrot-seed grass,
klitsgras.

Annual; culms usually decumbent; 110–400 mm tall. Leaf blades 20–60 mm long; 2–4 mm wide. Spikelets (lowest in each cluster) 3.5–5.0 mm long. Inflorescence loosely spike-like; spikelets clustered on peduncles that are much shorter than the spikelets; lowest glume 7-nerved, spaces between nerves about the same width as nerves; glume hairs hooked at tips; anthers 0.6–0.8 mm long.

Flowering November to May. Limestone and sandy soils, often in moist places and disturbed areas. Common. Biome: Savanna, Grassland, and Nama-Karoo. Mediterranean region, Africa, SW Asia, introduced to America. Ruderal weed. May be confused with *T. berteronianus*, which has smaller spikelets and anthers, and 5-nerved glumes.



Description: Stapf 1898–1900 (577), Chippindall 1955 (107). Illustration: Chippindall 1955 (fig. 78). Voucher: Smook 2774. PRECIS code 9902740–00400.

- 9(8). Glumes glabrous 10
 Glumes pubescent **T. obtusifolium**
 10(9). Hairs on lemmas club-shaped ... **T. acutiflorum**
 Hairs on lemmas not club-shaped . **T. oblitterum**

Tribolium Desv.

Brizopyrum Stapf, *Lasiochloa* Kunth, *Plagiochloa* Adamson and Sprague.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose. Culms 20–600 mm high; herbaceous; branched above, or unbranched above. Plants unarmed. Leaf blades flat, or rolled. Ligule a fringed membrane to a fringe of hairs.

Inflorescence a single spike, or a single raceme, or paniculate; contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; biseriate, or not two-ranked; imbricate; 2–10 mm long; compressed laterally, or not noticeably compressed; disarticulating above the glumes; disarticulating between the florets (tardily). Callus short. Glumes two; relatively large; very unequal, or more or less equal; markedly shorter than the spikelets to much exceeding the spikelets; awned (shortly), or awnless; similar (naviculate, membranous to chartaceous). Lower glume 5 nerved. Incomplete florets distal to the female-fertile florets, merely underdeveloped, awnless; proximal incomplete florets absent.

Female-fertile florets 2–9 (occasionally to 14). Lemmas less firm than the glumes to similar in texture to the glumes (membranous to chartaceous); hairy (usually with clavate hairs), or hairless; without a germination flap; 5–9 nerved; entire; awnless to mucronate. Palea present; relatively long; 2-nerved. Lodicules 2; fleshy; ciliate, or glabrous. Stamens 3. Ovary glabrous. Fruit small (1–1.2 mm); hilum short; pericarp fairly loosely adherent; embryo small.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Arundinoideae; Danthonieae. 11 species. South Africa. Mesophytic to xerophytic (winter rainfall); in open habitats (Fynbos and Karoo); glycophytic. Cape Province. 11 indigenous species.

References. 1. Renvoize. 1985. Kew Bull. 40: 795.

Species treatment by N.P. Barker.

- 1(0). Spikelets distichously arranged 2
 Spikelets not distichously arranged 5
 2(1). Spike clearly exerted from uppermost leaf 3
 Spike partially enclosed by uppermost leaf 4
 3(2). Glumes usually glabrous; spikelets up to 6 mm long;
 spike up to 70 mm long; plant up to 600 mm tall
 **T. uniolae**
 Glumes pubescent; spikelets 4–5 mm long; spike up
 to 25 mm long; plant up to 300 mm tall
 **T. brachystachyum**
 4(2). Glumes glabrous **T. amplexum**
 Glumes pubescent **T. alternans**
 5(1). Plants annual 6
 Plants perennial 8
 6(5). Glumes covered in blunt, apically rounded hairs;
 lemmas have two basal tufts of hairs on each
 margin **T. utriculosum**
 Glumes covered in slender, tapering hairs; lemma
 margins fringed with hairs, but not tufted 7
 7(6). Spikelets to 1.5 mm long; panicle up to 10 mm long
 **T. ciliare**
 Spikelets 3.5–4.0 mm long; panicle up to 40 mm long
 **T. echinatum**
 8(5). Glumes densely pubescent, hairs up to 1.5 mm long
 **T. hispidum**
 Glumes glabrous or pubescent but not densely so and
 then hairs shorter than 1 mm 9



Fig. 222. *Tribolium uniolae*

Tribolium acutiflorum (Nees) Renvoize

(=*Plagiochloa acutiflora*
(Nees) Adamson & Sprague) 1.

Perennial (sometimes weakly so); slender, tufted; 100–300 mm tall. Leaf blades 50(–120) mm long; to 3 mm wide. Spikelets 4–5 mm long. Panicle spike-like, 10–25 mm long, partly enclosed in uppermost leaf; spikelets not distichous, 4–6-flowered; glumes glabrous, shorter than florets, acute, acuminate or minutely awned, sometimes with a few hairs along the keel; lemmas pubescent along keel and margins, hairs club-shaped.

Flowering September to January. Sandy soils and disturbed areas. Locally common. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Chippindall 1955 (115). Voucher: Davidse 33415A. PRECIS code 9904021–00100.

**Tribolium alternans** (Nees) Renvoize

(=*Plagiochloa alternans*
(Nees) Adamson & Sprague) 1.

Perennial; tufted; to 700 mm tall. Leaf blades to 300 mm long; to 5 mm wide. Spikelets 6–7(–10) mm long; 4 mm wide. Inflorescence a loose spike, 40–60 mm long, partly enclosed by uppermost leaf; spikelets 4–8-flowered, barely overlapping each other, distichous on a triangular rachis with a small, pointed lobe or appendage opposite some or all spikelets; glumes sparsely pubescent, hairs glassy, tuberculate; lower half of lemma pubescent, hairs club-shaped.

Flowering October to December. River flats in sandy soil. Infrequent. Biome: Fynbos. Endemic.

Description: Chippindall 1955 (115). Voucher: Hanekom 2638. PRECIS code 9904021–00200.

**Tribolium amplexum** Renvoize

Perennial; tufted; 200–700 mm tall. Leaf blades 100–200 mm long; to 4 mm wide. Spikelets 4–7 mm long; 1.5–3.5 mm wide. Panicle spicate, 25–50 mm long, 5–7 mm wide, partly enclosed by uppermost leaf; spikelets 4–6-flowered, distichous on a triangular, scabrid rachis; glumes glabrous; lower half of lemma pubescent, hairs long, club-shaped.

Flowering September to December. Sandy soils in disturbed areas. Infrequent. Biome: Fynbos. Endemic.

Description: Renvoize 1985 (797), Chippindall 1955 (115). Voucher: Oliver 4682. PRECIS code 9904021–00300.

**Tribolium brachystachyum** (Nees) Renvoize

(=*Plagiochloa brachystachya*
(Nees) Adamson & Sprague) 1.

Perennial; prostrate to tufted; to 300 mm tall. Leaf blades 10–120 mm long (rarely longer); about 2.5 mm wide. Spikelets 4–5 mm long; to 3.5 mm wide. Inflorescence a compacted spike, to 25 mm long, exerted from the uppermost leaf; spikelets (4–)5–6-flowered, distichous, overlapping for 3–4 or more of their length; glumes pubescent, hairs glassy; lower half of lemmas pubescent, hairs club-shaped; keels of paleas



may be slightly winged.

Flowering October to January. Sandy soils in mountains and in disturbed areas. Locally common. Biome: Fynbos. Endemic. May be confused with *T. alternans*, which has a larger, less compacted spike and larger spikelets.

Description: Stapf 1898–1900 (707), Chippindall 1955 (115). Voucher: Ellis 2855. PRECIS code 9904021–00400.

Tribolium ciliare (Stapf) Renvoize

(=*Plagiochloa ciliaris* (Stapf)
Adamson & Sprague) 1.

Annual; weakly tufted; to 100 mm tall. Leaf blades to 20 mm long; to 1 mm wide. Spikelets to 1.5 mm long; to 1 mm wide. Panicle to 10 mm long, partly enclosed in the uppermost leaf sheath; spikelets not distichous; glumes pubescent, hairs glassy, tubercle-based, tapering apically; lemma backs glabrous but lower margins fringed with acicular hairs and upper margins fringed with a few tubercle-based hairs.

Flowering September to October. On limestone outcrops. Locally common (in the Bredasdorp district). Biome: Fynbos. Endemic.

Description: Stapf 1899 Hook. Icon. Pl. Plate. 27 t2602. Voucher: Davidse 33525. PRECIS code 9904021–00500.

**Tribolium echinatum** (Thunb.) Renvoize

(=*Lasiochloa echinata*
(Thunb.) Adamson) 1.

Annual; prostrate to tufted; to 250 mm tall. Leaf blades to 150 mm long; to 5 mm wide. Spikelets 3.5–4.0 mm long; 1.0–1.5 mm wide. Leaves pubescent, sometimes densely so; panicle to 40 mm long, partly enclosed in uppermost leaf; spikelets (2–)3(–4)-flowered, not distichous; glumes long-acuminate, pubescent, hairs long, glassy, tuberculate, tapering apically; lemmas glabrous except for a fringe of hairs on the lower margins.

Flowering August to November. Sandy soils and roadsides. Locally common. Biome: Fynbos and Succulent Karoo. Endemic.

Description: Chippindall 1955 (116). Voucher: Davidse 33250. PRECIS code 9904021–00600.

**Tribolium hispidum** (Thunb.) Renvoize

(=*Lasiochloa longifolia*
(Schr.) Kunth) 1.

Perennial; tufted; to 400 mm tall. Leaf blades to 250 mm long; to 4 mm wide. Spikelets 3–4 mm long; to 1.5 mm wide. Panicle 10–50(–70) mm long; spikelets (2–)3(–4)-flowered, not distichous; glumes densely pubescent, hairs 1.0–1.5 mm long, tubercle-based; lower margin of lemma fringed with hairs.

Flowering August to February. Sandy soils. Locally common (Cedarburg-Clanwilliam area and in Renosterbosveld). Biome: Fynbos, Grassland, and Succulent Karoo. Endemic.

Description: Chippindall 1955 (116). Illustration: Chippindall 1955 (fig. 85). Voucher: Smook 3633. PRECIS code 9904021–00700.



Tribolium obliterum (Hemsl.) Renvoize

(=*Plagiochloa oblittera*
(Hemsl.) Adamson &
Sprague) 1.



Perennial; stoloniferous, prostrate or tufted; 100–350 mm tall. Leaf blades to 150 mm long; to 2 mm wide. Spikelets 4–5 mm long; to 2 mm wide. Panicle 15–25 mm long, often partly enclosed in the uppermost sheath; spikelets 3–4(–6)-flowered, not distichous; glumes glabrous, as long as florets; lemma keels and/or margins fringed with hairs which are not club-shaped.

Flowering September to December. Disturbed areas such as cultivated fields and roadsides. Locally common. Biome: Fynbos. Endemic.

Description: Chippindall 1955 (115). Voucher: Davidse 33840. PRECIS code 9904021–00800.

Tribolium obtusifolium (Nees) Renvoize

(=*Lasiochloa obtusifolia*
Nees) 1.



Perennial; stoloniferous; to 250 mm tall. Leaf blades to 200 mm long; to 1 mm wide. Spikelets 3–4 mm long; 1.5–2.0 mm wide. Panicle 20–30 mm long; spikelets 2–3-flowered, not distichous; glumes pubescent, but not densely so, hairs tapering and glassy, especially along the keel; lemma margins fringed with hairs which are not club-shaped.

Flowering September to November. Sandy areas. Infrequent. Biome: Fynbos. Endemic.

Description: Chippindall 1955 (116). Voucher: Duthie 1761a. PRECIS code 9904021–00900.

Tribolium uniolae (L.f.) Renvoize

(=*Plagiochloa uniolae* (L. f.)
Adamson & Sprague var.
uniolae 1; (= *Plagiochloa*
uniolae (L. f.) Adamson &
Sprague var. *villosa* (Stapf)
Adamson) 1.

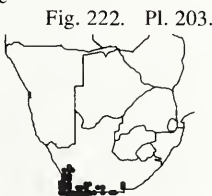


Fig. 222. Pl. 203.

Perennial; tufted; 100–600 mm tall. Leaf blades to 200 mm long; to 3 mm wide. Spikelets to 6 mm long; to 4 mm wide. Inflorescence a spike, 8–70 mm long, often branched at the base, exerted from uppermost leaf; spikelets 5–9-flowered, distichous; glumes usually glabrous; lower half of lemma backs pubescent, hairs club-shaped, margins fringed with stout hairs.

Flowering September to December. Disturbed areas such as roadsides and fields. Locally common. Biome: Fynbos. Endemic.

Description: Stapf 1898–1900 (705). Illustration: Chippindall 1955 (fig. 84 (inflorescence only)). Voucher: Davidse 34149. PRECIS code 9904021–01000.

Tribolium utriculosum (Nees) Renvoize

(=*Lasiochloa utriculosa*
Nees) 1.



Annual; tufted; to 90 mm tall. Leaf blades 10–100 mm long; to 2.5 mm wide. Spikelets 2–3 mm long; to 2 mm wide. Leaf blades sparsely pubescent; panicle 10–20 mm long, usually partly enclosed in uppermost leaf; spikelets not distichous; glumes

pubescent, hairs short, glassy, tuberculate, apically blunt and rounded; lemma margins with two tufts of club-shaped hairs.

Flowering August to October. Sandy alluvial soils and disturbed areas. Locally common. Biome: Succulent Karoo. Endemic.

Description: Chippindall 1955 (116). Illustration: Chippindall 1955 (fig. 86). Voucher: Thompson & Le Roux 99. PRECIS code 9904021–01100.

Tricholaena Schrad.

Annual (rarely), or perennial; caespitose, or decumbent. Culms 100–1200 mm high; herbaceous; unbranched above. Leaf blades often glaucous-inrolled, rigid. *Ligule a fringed membrane (very narrow), or a fringe of hairs. Plants with hermaphrodite florets.*

Inflorescence paniculate; open, or contracted; espathate. *Spikelet-bearing axes persistent.*

Spikelets 2–3.5 mm long; *compressed laterally.* Glumes present; one per spikelet, or two; very unequal; awnless (the upper sometimes mucronate); very dissimilar (the lower often reduced to a tiny scale, hairy or glabrous), or similar (rarely). *Lower glume* 0–1 nerved. *Proximal incomplete florets* 1; paleate, palea fully developed; florets male. *Proximal lemmas* awnless.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes (sub-crustaceous); smooth; hairless (shiny); having the margins lying flat and exposed on the palea; 3–5 nerved; entire to incised; awnless. Palea present; relatively long. Lodicules 2; glabrous. Stamens 3. Ovary glabrous. Hilum short; embryo large.

Photosynthetic pathway. C₄; XyMS+. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 9$. Panicoideae; Panicoideae; Paniceae (Melinideae). 12 species. Africa, Madagascar, Canaries, Mediterranean. Xerophytic; in open habitats (sandy and stony soil, sometimes ruderal); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, and Cape Province. 2 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Launert. 1970. FSWA. 3. Anderson. 1961. Kirkia 1: 103. 4. Clayton & Renvoize. 1982. FTEA. 5. Zizka. 1988. Bibliotheca Botanica, 138.

Species treatment by H.M. Anderson.

- 1(0). Culms rarely branching from lower or middle nodes; leaves sometimes hairy; spikelets glabrous or very rarely hairy **T. monachne**
Culms often branching from lower and middle nodes; leaves and spikelets hairy 2
2(1). Lower glume 1–3 mm long; spikelets with hairs 1–3 mm long **T. capensis** subsp. **capensis**
Lower glume a scale 0.1–0.4(–2.0) mm long; spikelets with hairs 0.5–2.0 mm long
..... **T. capensis** subsp. **arenaria**

Tricholaena capensis (Licht. ex Roem. & Schult.) Nees subsp. **arenaria** (Nees) Zizka

(=*T. arenaria* Nees) 2; (= *T. arenaria* Nees var. *glaucula* (Hack.) Stapf) 2.

Perennial; tufted; 200–600 mm tall. Leaf blades 30–70 mm long; 2.0–3.5 mm wide. Spikelets 2–3 mm long; 1 mm wide. Culms branching from lower nodes;



culm nodes, leaves and spikelets hairy; lower glume nearly always a scale 0.1–0.4 (–2.0) mm long; glumes and lemmas covered sparingly with short hairs 0.2–2.0 mm long.

Flowering January to April. Sandy, dry areas. Locally common. Biome: Nama-Karoo. Endemic. This subspecies is restricted to Namibia and is sympatric near the Orange River with subsp. *capensis*, which has more hairy spikelets

and a larger lower glume.

Description: Zizka 1988 (49). Voucher: Giess 10250. PRECIS code 9901330–00050.

Tricholaena capensis* (Licht. ex Roem. & Schult.) Nees subsp. *capensis

Perennial; tufted; 200–600 mm tall. Leaf blades 30–70 mm long; 2.0–3.5 mm wide. Spikelets 2–3 mm long; 1 mm wide. Culms branching from lower nodes; culms, leaves and spikelets hairy; lower glume 1–3 mm long; glumes and lemmas covered with dense hairs 1–3 mm long.

Flowering January to June. Sandy, dry soil. Locally common. Biome: Nama-Karoo and Succulent Karoo. Endemic. See note under *T. capensis* subsp. *arenaria*.

Description: Zizka 1988 (48). Chippindall 1955 (435). Illustration: Chippindall 1955 (fig. 361). Voucher: Davidse 6209. PRECIS code 9901330–00100.



***Tricholaena monachne* (Trin.) Stapf & C.E. Hubb.**

Fig. 223. Pl. 204.

Blousaadgras.

Perennial, or annual; 200–1000 mm tall. Leaf blades 30–70 mm long; 2.0–3.5 mm wide. Spikelets 2–3 mm long; 1 mm wide. Culm glabrous; leaves sometimes hairy; spikelets usually glabrous or very rarely hairy.

Flowering November to March. Favours sandy soil, also occurs as a ruderal. Common. Biome: Savanna and Grassland. Tropical Africa. Natural pasture. An annual form occurs in Namibia that is less than 300 mm tall with a softer appearance than the hardy, wiry, drought resistant perennial form. The spikelets in this species are usually glabrous, but individuals with hairy spikelets can be separated by their glabrous culms from *T. capensis*, which has hairy culms. *T. monachne* is distinguished from *Panicum* species which have distinct lower glumes never reduced to a scale, and *Eriochloa meyeriana* which has a scale-like lower glume, but it is broadly ovate and clasps the base of the spikelet.

Description: Chippindall 1955 (434), Zizka 1988 (38). Illustration: Chippindall 1955 (fig. 360). Voucher: Smook 4234. PRECIS code 9901330–00300.



***Trichoneura* Anderss.**

Crossotropis Stapf.

Annual, or perennial; xeromorphic. Culms 120–1000 mm high; herbaceous; branched above (often), or unbranched above. Leaf blades linear (pointed); usually flat. Ligule an unfriended membrane.

Inflorescence of spike-like main branches (the racemes scattered along a central axis); open; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; 5.3–14 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. Glumes two; more or less equal; about equalling the spikelets to much exceeding the spikelets; awned, or awnless (tapered into a mucro or short awn); similar (narrowly lanceolate, membranous, persistent). Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.

Female-fertile florets 2–8. Lemmas similar in texture to the glumes (membranous); non-carinate (rounded on the back); 3 nerved; incised; mucronate, or awned. Awns when present 1; from the sinus; non-geniculate; much shorter than

Fig. 223. *Tricholaena monachne*

Photosynthetic pathway and related features. C_4 ; $XyMS+$. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 7 species. America, tropical Africa. Xerophytic; in open habitats (in sandy or stony soil). Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 3 indigenous species.

References. 1. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Plants perennial; inflorescences broadly pyramidal, 70–320 mm long; primary branches stiff and straight, usually longer than 1/2 the central axis, often spreading horizontally; glumes as long as, or to twice as long as the spikelets. ***T. grandiglumis***
Plants annual; inflorescences broadly lanceolate, 40–190 mm long; primary branches firm, often slightly curved, shorter than 1/2 the central axis, somewhat contracted but never spreading horizontally; glumes as long as the spikelets. . . . 2
2(1). Culms decumbent or ascending, 90–350 mm tall; panicle usually 40–90(–130) mm long; from Namibia ***T. eleusinoides***
Culms erect, 340–660 mm tall, panicle 120–190 mm long; from the Zoutpansberg district of Transvaal ***T. sp.* (=Codd 5325)**

Trichoneura eleusinoides (Rendle) Ekman

Annual; tufted; 90–350 mm tall. Leaf blades 20–45 mm long; 2–3 mm wide. Spikelets 3–4 mm long. Inflorescence up to 90 mm long, 50 mm wide, contracted with side branches stiff, shorter than 30 mm and not spreading more than 45 degrees.

Flowering January to May. Rocky outcrops and granite mountain slopes. Infrequent to locally common. Biome: Savanna, Nama-Karoo, and Desert. To east Africa.

Description: Chippindall 1955 (129). Voucher: Dinter 7053. PRECIS code 9903530–00100.



Trichoneura grandiglumis (Nees) Ekman

Rolling grass, waaigras.

Fig. 224. Pl. 205.

Perennial; tufted (culms slender; erect or ascending); 220–630 mm tall. Leaf blades 30–200 mm long; 3–7 mm wide. Spikelets 5–14 mm long. Inflorescence branches spreading horizontally; spikelets 4–9-flowered; glumes 5.0–13.5 mm long.

Flowering November to April. On sandy soils on hillsides or open floodplains and in bushveld, sometimes in disturbed areas. Common. Biome: Savanna and Grassland. Africa south of the Congo Basin. The length of the glumes and the spikelets vary considerably. Previously two varieties, var. *grandiglumis* and var. *minor*, were distinguished on spikelet length (5.3–14.0 mm and 5.3–8.2 mm respectively), and the ratio of the awns (longer than and shorter than the floret respectively). No clear separation of specimens are given by these two characters and pending further investigation, these varieties are not upheld.

Description: Chippindall 1955 (128), Clayton et al. 1970–1982 (299). Voucher: Huntley 967, Strey R.S.B. 53. PRECIS code 9903530–00200.



Fig. 224. *Trichoneura grandiglumis*

the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; pericarp fused; embryo large.

Trichoneura sp. (=Codd 5325)

Annual; tufted (slender with leaves mostly cauline); 340–660 mm tall. Leaf blades 50–150 mm long; 2–4 mm wide. Spikelets 5–11 mm long. Panicle up to 190 mm long with branches not spreading more than 45 degrees; spikelets more or less their own length apart.



Flowering January to April. Sandy soil in rocky areas. Infrequent to locally common. Biome: Savanna. This species resembles *T. eleusinoides* but Chippindall (1955) regards it as an undescribed annual species. Specimens of this species have mistakenly been identified as *T. schlechteri*, a perennial known from Lourenco Marques and not recorded for the FSA area.

Description: Chippindall 1955 (129). Voucher: Codd 5325. PRECIS code 9903530–99999.

Trichopteryx Nees

Annual, or perennial (with slender culms); caespitose, or decumbent. Culms 20–900 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear-lanceolate to lanceolate. Ligule a fringe of hairs. Plants with hermaphrodite florets.

Inflorescence paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets solitary, or in pairs; consistently in 'long-and-short' combinations, or not in distinct 'long-and-short' combinations. Spikelets 2.5–6 mm long; compressed laterally to not noticeably compressed; disarticulating above the glumes (disarticulating readily between L1 and L2, less readily between G2 and L1). Hairy callus present. Glumes two; relatively large; very unequal (G1 one third to one half spikelet length); awnless (though the G1 can be aristulate and the G2 acuminate); similar (membranous or papery, G1 narrower). Proximal incomplete florets 1; paleate, palea fully developed (two keeled, thin); male, or sterile.

Female-fertile florets 1. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (membranous, hardening to leathery); hairy (with a sub-marginal tuft of erect hairs, in the middle on each side); the margins tucked in onto the palea (the palea embraced and almost enclosed); without a germination flap; 5–7 nerved; incised; awned. Awns 1 (from the sinus), or 3; median, or median and lateral (with the lobes terminating in awns, in addition to the median awn). The median awn different in form from the laterals (when laterals present); from the sinus; geniculate (the lateral awns, when present, straight); much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy. Stamens 2. Ovary glabrous. Hilum long-linear; embryo large.

Photosynthetic pathway. C₄. The anatomical organization conventional, or unconventional. Organization of PCR tissue when unconventional *Arundinella* type. XyMS–. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 12$ (?). Panicoideae; Panicodae; Arundinelleae. 5 species. Southern and tropical Africa, Madagascar. Helophytic, or mesophytic; in shade, or in open habitats (streambanks, grasslands and forest margins); glycophytic. Namibia, Transvaal, Swaziland and Cape Province (Transkei). 1 indigenous species.

References. 1. Clayton et al. 1972. FTEA.

Species treatment by H.M. Anderson.



Fig. 225. *Trichopteryx dregeana*

Trichopteryx dregeana Nees

Vleigras.

Perennial; tufted; to 900 mm tall. Leaf blades to 500 mm long (light green); 4 mm wide. Spikelets 4–7 mm long. Grows in a tangled mass, leaves spreading and reflexed; panicle open, up to 140 mm long; spikelets with a whorl of hairs at the base; glumes and lower lemma bright brown and tips transparent; female-fertile (upper) lemma with two conspicuous tufts of white hairs, side awns 2–3 mm long, central awns slender, 4–7 mm long.

Flowering December to May. Vleis and wet places, shady crevices among rocks on hillsides. Locally common. Biome: Savanna and Grassland. Southern tropical Africa. Habit similar to *Eragrostis volkensii*, which can be distinguished vegetatively by the blades being blue-green, wider (up to 8 mm) and stiffer.

Description: Chippindall 1955 (287). Illustration: Chippindall 1955 (fig. 257). Voucher: Kluge 1694. PRECIS code 9901750–00100.

Fig. 225. Pl. 206.



Tripogon Roem. & Schult.

Archangelina Kuntze, *Kralikia* Coss. & Dur.,
Kralikiella Batt. & Trab., *Plagiolytrum* Nees.

Annual, or perennial; caespitose. Culms 40–650 mm high; herbaceous; unbranched above. *Leaves without auricles*. Leaf blades linear (often filiform). Ligule an unfringed membrane to a fringe of hairs.

Inflorescence a single spike (slender); espatheate. Spikelet-bearing axes persistent.

Spikelets solitary; alternately *distichous*; 3–25 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. *Glumes* two; very unequal, or more or less equal; markedly shorter than the spikelets; *dorsiventral to the rachis*; awnless; very dissimilar, or similar (membranous, narrow, G1 often asymmetric). Incomplete florets distal to the female-fertile florets, merely underdeveloped; *proximal incomplete florets absent* (rarely, L1 also neuter).

Female-fertile florets 3–20. Lemmas 1–3 nerved; mucronate, or awned. Awns when present 1, or 3, or 5 (usually awned or mucronate from a median sinus or behind the apex, the lobes sometimes awned or mucronate); median, or median and lateral (via mucronate to awned lobes). The median awn similar in form to the laterals (when laterals present); from the sinus, or apical; non-geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present. Lodicules

2; fleshy; glabrous. Stamens 2, or 3. Ovary glabrous. Fruit small (0.8–2.2 mm); hilum short; pericarp fused; embryo large, or small (1/3 the length of the fruit or somewhat less).

Photosynthetic pathway and related features. C_4 ; XyMS+. PCR sheath outlines even. PCR sheath extensions present. Maximum number of extension cells 1. PCR cell chloroplasts centripetal.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. About 30 species. Tropical Africa, Asia, Australia. Helophytic to xerophytic; in open habitats; glycophytic. Namibia, Botswana, Transvaal and Natal. 1 indigenous species.

References. 1. Clayton. 1970. FTEA. 2. Clayton et al. 1974. FTEA.

Species treatment by M. Koekemoer.

Tripogon minimus (A. Rich.) Steud.

(= *T. abyssinicus* sensu
Chippind., non Nees) 1.

Fig. 226. Pl. 207.



Perennial; tufted; 80–220 mm tall. Leaf blades 10–90 mm long, filiform; to 0.5 mm wide. Spikelets 2.6–8.0 mm long. Old leaf sheaths divide into coarse fibres; spikes 20–80 mm long, slender, erect; spikelets 5–10-flowered; lemma tip emarginate and mucronate.

Flowering December to May. Mostly in shallow soil on rocky outcrops but also in waterlogged sand and seasonal pans. Infrequent. Biome: Savanna. Tropical east Africa and Madagascar.

Description: Phillips & Launert 1971 Kew Bull. 25,2 (301), Clayton et al. 1970–1982 (289). Illustration: Kew Bull. 25,2 (fig. 1). Voucher: Killick & Leistner 3371. PRECIS code 9903180–00100.

Triraphis R.Br.

Annual, or perennial; caespitose (mostly small xeromorphs). Culms (10–)40–1400 mm high; herbaceous. Leaf blades flat, or rolled (or junciform). *Ligule a fringe of hairs*.

Inflorescence paniculate; open, or contracted (rarely spiciform); espatheate. Spikelet-bearing axes persistent.

Spikelets compressed laterally; disarticulating above the glumes; disarticulating between the florets. *Glumes* two; relatively large; very unequal (rarely), or more or less equal; *markedly shorter than the spikelets*; awned (or mucronate, from the sinus), or awnless; similar (narrow, persistent). Incomplete florets distal to the female-fertile florets, merely underdeveloped; proximal incomplete florets absent.

Female-fertile florets 5–10. Lemmas 3 nerved; incised; *deeply cleft*; awned. Awns 3, or 5; median and lateral (the lateral lobes setiform-awned or mucronate). The median awn similar in form to the laterals (setiform); from the sinus (of the central lobe); non-geniculate. Palea present; shorter than the lemma. Lodicules 2; fleshy, or membranous; glabrous. Stamens 3. Ovary glabrous. Fruit small; linear; hilum short; pericarp fused; embryo large.

Photosynthetic pathway and related features. C_4 ; NAD-ME (*mollis*); XyMS+. PCR sheath outlines uneven. PCR sheath extensions present. Maximum number of extension cells 3. PCR cell chloroplasts ovoid; with well developed grana; centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Chloridoideae; Chlorideae *sensu lato*. 7 species. Tropical and southern Africa, Australia. Mesophytic to xerophytic; in open habitats (savanna, in sandy or



Fig. 226. *Tripogon minimus*

rocky soil); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Natal, and Cape Province. 5 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton. 1970. FTEA. 3. Launert. 1970. FSWA.

Species treatment by M. Koekemoer.

- 1(0). Plants annual; leaves mostly basal 2
 Plants perennial; leaves mostly cauline 3
 2(1). Plants shorter than 250 mm; panicle dense, widely
 elliptic, 10–30 mm long; anthers shorter than 0.5
 mm *T. pumilio*
 Plants to 770 mm tall; panicle open to dense, widely
 ovate, longer than 30 mm; anthers 1.2–2.0 mm long
 *T. purpurea*
 3(1). Culms profusely branched, yellowish; plants tufted;
 spikelets 4–15 mm long; central awn of the lemmas
 longer than the lemmas *T. ramosissima*
 Culms unbranched, dark brown to reddish; plants
 rhizomatous or tufted; spikelets to 10 mm long;
 central awn of the lemmas shorter or longer than
 the lemmas 4
 4(3). Central awn of lemmas shorter than the lemmas;
 rhizomes long and very well developed; panicles
 dense, 120–300 mm long *T. andropogonoides*
 Central awn of lemmas longer than the lemmas;
 rhizomes short; panicles sparse, to 400 mm long
 *T. schinzii*

Triraphis andropogonoides (Steud.) Phill.

Besemgras.

Fig. 227. Pl. 208.

Perennial; rhizomatous (long creeping rhizome); 380–1220 mm tall. Leaf blades 200–400 mm long; 2–6 mm wide. Spikelets 6–10(–15) mm long. Plant base dark brown to reddish; rootstock very well developed; tillers very loosely grouped; panicle dense, 120–300 mm long; spikelets 5–15-flowered, central awn shorter than the lemma; anthers 1.2–2.3 mm long.

Flowering October to May. Well-drained soil on rocky slopes or in deep sand in open grassland. Common. Biome: Fynbos, Savanna, Grassland, and Nama-Karoo. Endemic. Similar to *T. schinzii*, which has a central lemma awn longer than the lemma and short rhizomes. Some interesting specimens were collected in the Bathurst and Alexandria districts. They resemble *T. andropogonoides* in all aspects, except that the culms are fasciculately branched at the nodes.

Description: Chippindall 1955 (125). Illustration: Chippindall 1955 (fig. 98). Voucher: Van der Schijff 5321. PRECIS code 9903500–00100.

Triraphis pumilio R. Br.

Annual; tufted; 40–220 mm tall. Leaf blades 50–120 mm long; 2 mm wide. Spikelets 2–4 mm long. Panicle dense, ovoid, 5–30 mm long; spikelets 3–11-flowered; lemma 3-nerved; central awn about as long as the lemma; anthers 0.2–0.4 mm long.

Flowering January to May. In riverbeds or moist depressions in sand. Locally common. Biome: Desert. Northern Africa through Mauritania to Arabia.

Description: Launert 1970 (160:211), Stapf 1898–1900 (653), Chippindall 1955 (127). Illustration: Chippindall

1955 (fig. 99). Voucher: Oliver & Muller 6661. PRECIS code 9903500–00400.



Fig. 227. *Triraphis andropogonoides*

Triraphis purpurea Hack.

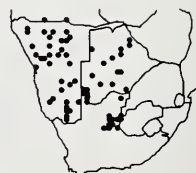
(= *T. fleckii* Hack.) 2.

Red honey grass.

Annual; tufted; 90–770 mm tall. Leaf blades 35–60 mm long; 1–2 mm wide. Spikelets 6–10 mm long. Panicle longer than 30 mm, open or dense; spikelets 5–11 (–24)-flowered; anthers 1.2–2.0 mm long.

Flowering January to June. Often in moist patches in the shade on red sand or rocky calcareous soils. Common. Biome: Savanna, Nama-Karoo, and Desert. Endemic. At the moment this taxon contains all annual specimens that do not match *T. pumilio*. Launert (1970) recognizes three groups within this species, based on the types of *T. purpurea*, *T. fleckii* Hack. and *T. welwitschii* Rendle, but is reluctant to assign any taxonomic ranks until a proper revision can be done.

Description: Launert 1970 (160:212), Muller 1984 (262), Stapf 1898–1900 (653), Chippindall 1955 (127). Illustration: Muller 1984 (fig. 132). Voucher: Van Vuuren & Giess 1095. PRECIS code 9903500–00500.



Triraphis ramosissima Hack.

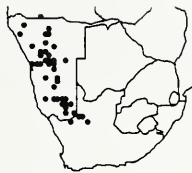
(=*T. elliotii* Rendle) 2.

Berggras.

Bushy perennial; rhizomatous and tufted; 250–810 mm tall. Leaf blades 60–120 mm long; 1 mm wide. Spikelets 4–15 mm long. Culms yellowish and woody, branching profusely; spikelets 4–19-flowered, central awn longer than the lemma.

Flowering February to June. Rocky hillslopes, on floodplains, in dry watercourses, often in sand or calcareous soil. Common. Biome: Savanna, Nama-Karoo, and Succulent Karoo. Endemic. Distinguished from other *Triraphis* species by the profusely branched culms.

Description: Muller 1984 (264), Stapf 1898–1900 (651), Chippindall 1955 (125). Illustration: Muller 1984 (fig. 133), Chippindall 1955 (fig. 97). Voucher: De Winter 2618. PRECIS code 9903500–00600.



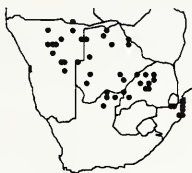
Triraphis schinzii Hack.

(=*T. schlechteri* Pilg. ex Stent) 2.

Perennial; short-rhizomatous and tufted; 700–1400 mm tall. Leaf blades 250–500 mm long; 2–5 mm wide. Spikelets 6–11 mm long. Plant base dark brown to reddish; panicle open, 200–400 mm long; central awn longer than the lemma.

Flowering November to April. Sandy grassland or bushveld, deep sand on dunes or riverbanks and on forest margins. Common. Biome: Savanna and Grassland. Tanganyika. Closely related to *T. andropogonoides*, which has a very well developed rhizome and the central awn of the lemma shorter than the lemma.

Description: Muller 1984 (266), Chippindall 1955 (125), Clayton et al. 1970–1982 (128). Illustration: Muller 1984 (fig. 134). Voucher: Story 6398. PRECIS code 9903500–00700.



Tristachya Nees

Apochaete (C. E. Hubbard) Phipps, *Dolichochaete* Phipps, *Loudetia* A. Br., *Monopogon* Presl, *Muantijamvella* Phipps, *Veseyochloa* Phipps.

Annual (rarely), or perennial; caespitose. Culms 150–2700 mm high; herbaceous. Leaf blades flat, or rolled (then involute or convolute, often rigid). Ligule a fringe of hairs. Plants with hermaphrodite florets.

Inflorescence a single raceme, or panicle; open; espatheate. Spikelet-bearing axes persistent.

Spikelets in triplets (the triads terminating the panicle branches); 10–45 mm long; compressed laterally to not noticeably compressed (?); disarticulating above the glumes. Glumes two; more or less equal; awnless (obtusate, or lanceolate to acuminate, or rostrate); similar; the lower glume exceeding the female-fertile lemma. Proximal incomplete florets 1; paleate, palea fully developed (narrow, two keeled); male.

Female-fertile florets 1. Lemmas similar in texture to the glumes to decidedly firmer than the glumes (leathery to cartilaginous); not becoming indurated; usually hairy, or hairless (hairs in tufts, rarely with tufts at the bases of the

lobes, or not in tufts); the margins tucked in onto the palea (palea enclosed, save at its summit); with a clear germination flap; 5–7 nerved; incised; awned. Awns 1; median; from the sinus (from between the lobes); geniculate; much longer than the body of the lemma. Palea present. Lodicules 2; fleshy (narrowly cuneate). Stamens 3 (usually?). Ovary hairy. Hilum long-linear; embryo large.

Photosynthetic pathway. C₄; XyMS-. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 10$ and 12. Panicoideae; Panicoideae; Arundinelleae. About 20 species. Tropical and southern Africa, Madagascar, tropical America. Helophytic to xerophytic; in shade and in open habitats (grassland and savanna, woodland and floodplains, wet to dry soils); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 6 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton et al. 1972. FTEA.

Species treatment by H.M. Anderson.



Fig. 228. *Tristachya leucothrix*

- 1(0). Pedicels free 2
Pedicels connate 3
2(1). Awns 40–120 mm long; culms markedly bulbous at base **T. superba**
Awns 15–35 mm long; culms partly swollen at base **T. lualabaensis**
3(1). Culms robust, 2–3-noded, 600–2000 mm long **T. nodiglumis**
Culms slender, 1–2-noded, 150–900 mm long ... 4
4(3). Upper lemma side-awns 3–5 mm long; tubercle-based hairs common on glumes and lower lemma **T. leucothrix**
Upper lemma side-awns longer than 10 mm; tubercle-based hairs on glumes only 5
5(4). Upper lemma side-awns 10–14 mm long; tubercle-based hairs along margins of glumes only **T. biseriata**
Upper lemma side-awns 18–24 mm long; tubercle-based hairs usually absent on glumes **T. rehmannii**

Tristachya biseriata Stapf

Perennial; tufted; 300–900 mm tall. Leaf blades 300–400 mm long; to 2 mm wide. Spikelets 20–25 mm long. Leaf blades filiform; pedicels connate; glumes with tubercle-based hairs along the margins; female-fertile (upper) lemma side-awns (10–)12 (–14) mm long, central awns 30–50 mm long.



Flowering October to March. Shallow stony soils on hillsides and rocky outcrops. Locally common. Biome: Grassland.

Description: Chippindall 1955 (277). Illustration: Chippindall 1955 (fig. 248). Voucher: Smook 4853. PRECIS code 9901740–00100.

Tristachya leucothrix Nees

(=*Apochaete hispida* (L. f.) J.B. Phipps) 2; (= *T. hispida* (L. f.) K. Schum.) 2.

Fig. 228. Pl. 209.



Rooisaadgras, trident grass.

Perennial; tufted; 150–900 mm tall. Leaf blades 50–400 mm long; 2–6 mm wide. Spikelets 24–45 mm long. Basal leaf sheaths covered with dense brown hairs at the base; pedicels connate; glumes and lower lemma with many tubercle-based hairs; female-fertile (upper) lemma side-awns 3–5 mm long, central awns 50–100 mm long.

Flowering October to March. Marshy grassland, mountain sourveld and on hillsides. Locally dominant (highland sourveld). Biome: Fynbos, Savanna and Grassland. Tropical Africa. Natural pasture (for sheep).

Description: Chippindall 1955 (276). Illustration: Chippindall 1955 (fig. 249). Voucher: Smook 1699. PRECIS code 9901740–00450.

Tristachya lualabaensis (De Wild.) J.B. Phipps

(= *T. hitchcockii* (C.E. Hubb.) Conert) 2.



Perennial; tufted; 700–1400 mm tall. Leaf blades 60–300 mm long; 2–6 mm wide. Spikelets 10–20 mm long. Culms partly swollen at the base but not bulbous; spikelets in triads, rarely in pairs, pedicels 5 mm and 10 mm long respectively; female-

fertile (upper) lemma side-awns 2–5 mm long, central awns 15–35 mm long.

Flowering January to March. Alluvial soils subject to flooding. Locally common (river floodplains). Biome: Savanna. Tropical Africa. Allied to *T. superba*, which has a bulbous base and much larger spikelets.

Description: Clayton et al. 1970–1982 (423). Voucher: Curson 669. PRECIS code 9901740–00540.

Tristachya nodiglumis K. Schum.

(= *T. eylesii* Stent & Rattray) 2.



Robust perennial; tufted; 600–2000 mm tall. Leaf blades 150–600 mm long; 3–13 mm wide. Spikelets 18–30 mm long. Panicle with 8–70 triads; pedicels connate; lower glume glabrous or with tubercle-based hairs; female-fertile (upper) lemma side-awns 10–20 mm long, central awns 30–60 mm long.

Flowering December to March. Floodplain grassland on sandy soil. Infrequent. Biome: Savanna. Tropical Africa. A variable species, which intergrades with *T. rehmannii*, which has tubercled hairs, and *T. longispiculata*, which has longer spikelets.

Description: Clayton et al. 1970–1982 (426). Illustration: Clayton et al. 1970–1982 (427). Voucher: Smith 2230. PRECIS code 9901740–00550.

Tristachya rehmannii Hack.

(= *Dolichochoete rehmannii* (Hack.) J.B. Phipps) 2.



Besemgras, broom trident grass.

Perennial; tufted; 200–900 mm tall. Leaf blades to 200 mm long; 1–3 mm wide. Spikelets 20–30 mm long. Leaf blades curling when old; pedicels connate; glumes and lower lemma glabrous or with occasional tubercle-based hairs; female-fertile (upper) lemma side-awns (18–)22 (–24) mm long, central awns 50–100 mm long.

Flowering November to March. Shallow stony soils. Locally common. Biome: Savanna and Grassland. Widespread in tropical Africa. Domestic use (brooms).

Description: Chippindall & Crook 1976, Chippindall 1955 (279). Illustration: Chippindall 1955 (fig. 250). Voucher: Liebenberg 8574. PRECIS code 9901740–00600.

Tristachya superba (De Not.) Schweinf. & Aschers.

(= *Loudetia superba* De Not.) 2.



Giant trident grass.

Perennial; tufted; 1200–2700 mm tall. Leaf blades to 600 mm long; 8–20 mm wide. Spikelets 25–35 mm long. Culms hard and bulbous at the base; spikelets in triads, rarely in pairs, pedicels unequal, 2–7 mm and 10–25 mm long respectively; female-fertile (upper) lemma side-awns 3–5 mm long, central awns 40–120 mm long.

Flowering February to August. Granite sandveld and Kalahari sands. Locally common (sandy areas, widespread). Biome: Savanna. Tropical Africa. Domestic use (culms used as drinking straws by Bushmen), or pasture (roots eaten by warthogs).

Description: Chippindall 1955 (281). Illustration: Chippindall & Crook 1976 (76). Voucher: Ellis 2747. PRECIS code 9901740–00700.

Urelytrum Hack.

Annual (rarely), or perennial; caespitose. Culms 600–2500 mm high; herbaceous (erect); unbranched above. *Leaves auriculate (the auricles from the sheaths, glabrous or hairy)*. Leaf blades linear; flat, or rolled (convolute). *Ligule an unfringed membrane*. Plants bisexual, with bisexual spikelets. *The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (the pedicellate spikelet usually with a long-awned G1)*.

Inflorescence of one to many long, rigid spike-like main branches; digitate or subdigitate, or non-digitate; espathate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (these long, many-noded); solitary to clustered; with substantial rachides; disarticulating at the joints.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. *The pedicellate spikelets with two florets, these male-only (or very rarely with one floret hermaphrodite), or sterile and reduced to the glumes; the lower glume conspicuously long-awned, the awns 5–10 mm long or longer*; Female-fertile spikelets 5–10 mm long; compressed dorsiventrally; falling with the glumes (and with the adjacent joint and pedicel). Glumes two; more or less equal; awned (G1 occasionally bi-auristulate), or awnless; very dissimilar (G1 leathery, dorsally flattened, 2-keeled, G2 thinner, naviculate-keeled). Proximal incomplete florets 1; paleate, palea fully developed; male.

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (about 3–4 mm long); ellipsoid; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 10$. Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. 7 species. South and tropical Africa, Madagascar. Mesophytic; in open habitats (savanna grassland); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Natal, and Cape Province. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Urelytrum agropyroides (Hack.) Hack.

(=*U. squarrosum* Hack.) 1.

Centipede grass, kinagras, quinine grass, varkstertgras.

Coarse perennial; tufted; 600–1600 mm tall. Leaf blades to 400 mm long; 1–6 mm wide (rolled when young and later when old). Spikelets (sessile) 7–8 mm long (pedicellate smaller except for awn). Inflorescence usually a solitary raceme; lower glume of pedicellate spikelets with a long rough recurved awn.

Flowering October to June. Open grassland and stony hillsides. Common. Biome: Savanna and Grassland. Tropical Africa and Madagascar. The large, awned single-raceme inflorescence resembles *Trachypogon spicatus*, which has hairy culm nodes, and *Heteropogon contortus*, which has awns from only the upper half of the inflorescence. Also, both these species have velvety awns and lack the bitter taste of *Urelytrum*.

Description: Chippindall 1955 (516), Clayton et al. 1970–1982 (833). Illustration: Chippindall 1955 (pl. 26), Flower. Pl. Afr. (47: 1841). Voucher: De Winter & Marais 4819. PRECIS code 9900170–00100.

Fig. 229. Pl. 210.

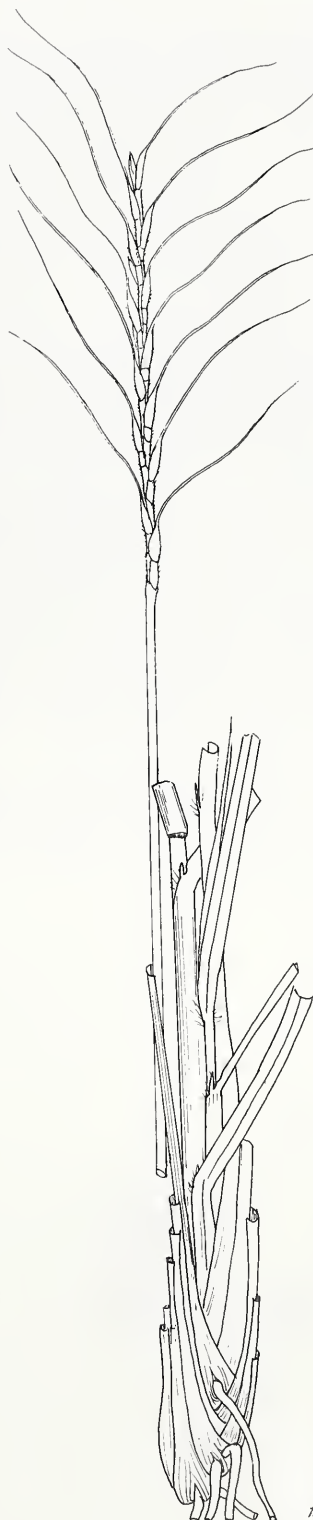


Fig. 229. *Urelytrum agropyroides*

Urochlaena Nees

Annual; caespitose. Culms 70–200 mm high; herbaceous (glabrous); much branched from the base. The uppermost sheath blade-bearing, broadly winged from the margins in the upper half and clasping the inflorescence. Leaf blades linear; flat, or rolled. *Ligule a fringed membrane. The spikelets of sexually distinct forms on the same plant; overtly heteromorphic (those at the bases of the lower branches 1-flowered, or consisting of 2–4 empty glumes).*

Inflorescence paniculate; deciduous in its entirety as a 'tumbleweed' (the culm disarticulates at the uppermost node, complete with inflorescence and uppermost leaf); contracted (to 25 mm long).

Female-fertile spikelets solitary; 4 mm long; compressed laterally (slightly); falling with the glumes (and with the whole inflorescence, the adjacent node and its leaf). Glumes two; relatively large; more or less equal; markedly shorter than the spikelets; awned (acuminate into scabrid 8–13 mm awns); similar (ovate-oblong, acuminate, membranous). Incomplete florets distal to the female-fertile florets, merely underdeveloped, awned; proximal incomplete florets absent.

Female-fertile florets 3–7. Lemmas similar in texture to the glumes; hairy (with fine tubercle-based marginal hairs above, and club-shaped hairs on the mid-nerve); without a germination flap; 7–9 nerved; entire; awned (tapering into the awn). Awns 1; median; apical; non-geniculate (curved); much shorter than the body of the lemma, to much longer than the body of the lemma (but shorter than the glume awns). Palea present (linear-oblong); relatively long (equalling the lemma); 2-nerved. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small (1–2 mm); hilum short (but relatively large); pericarp free; embryo large.

Photosynthetic pathway. C₃; XyMS+.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Arundinoideae; Danthonieae (?). 1 species. South Africa. Xerophytic; in open habitats (in Succulent Karoo); glycophytic. Cape Province. 1 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past.

Species treatment by N.P. Barker.



Fig. 230. *Urochlaena pusilla*

Urochlaena pusilla Nees

Annual; tufted; to 200 mm tall. Leaf blades to 30 mm long; to 1.5 mm wide. Spikelets to 6 mm long (including awns). Leaves expanded, soft, pubescent or glabrous; inflorescence a dense, spike-like panicle, 5–20 mm long and almost as wide, partially enclosed in the uppermost, modified leaf; spikelets 3–7-flowered; lemmas with tubercle-based, glassy hairs on upper half and club-shaped hairs along the central nerve and margins of the lower half.

Flowering September and October. Dry sandy areas and disturbed places such as roadsides. Locally common (near Nieuwoudtville). Biome: Succulent Karoo. Endemic. The entire inflorescence and uppermost leaf sheath disarticulate and are dispersed as a tumbleweed by wind.

Description: Chippindall 1955 (117). Illustration: Chippindall 1955 (fig. 87 (inflorescence only)). Voucher: Davidse 33398. PRECIS code 9903680–00100.

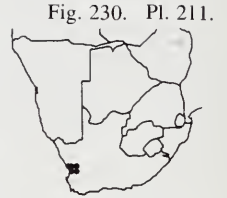


Fig. 230. Pl. 211.

Urochloa P. Beauv.

Annual, or perennial; long-rhizomatous, or long-stoloniferous, or caespitose, or decumbent. Culms 200–1700 mm high; herbaceous; branched above, or unbranched above. Leaf blades linear to lanceolate; flat, or rolled. *Ligule a fringed membrane to a fringe of hairs. Plants bisexual, with bisexual spikelets.* The spikelets of sexually distinct forms on the same plant (some spikelets reduced to disc-tipped pedicels), or all alike in sexuality.

Inflorescence of spike-like main branches (these sessile or subsessile); digitate or subdigitate, or non-digitate; espatheate. *Spikelet-bearing axes persistent.*

Spikelets solitary, or in pairs (or in fascicles of 3 to 4). *Female-fertile spikelets abaxial (when orientation ascertainable)*; compressed dorsiventrally; falling with the glumes. Glumes two; very unequal, or more or less equal (rarely); awnless; very dissimilar, or similar (membranous, the lower sometimes tiny). *Proximal incomplete florets 1*; paleate, or epaleate, palea when present fully developed to reduced; male, or sterile.

Female-fertile florets 1. Lemmas decidedly firmer than the glumes; *rugose*; becoming indurated (crustaceous); hairless; having the margins tucked in onto the palea; with a clear germination flap; 5–7 nerved; entire; usually awned (or at least strongly mucronate). Awns 1; median; apical; non-geniculate; much shorter than the body of the lemma. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small, ellipsoid to subglobose; hilum short; embryo large.

Photosynthetic pathway. C₄. The anatomical organization conventional. Biochemical type PCK (4 species); XyMS+. PCR cell chloroplasts centrifugal/peripheral.

Cytology, classification, distribution. Chromosome base number, $x = 7, 9$, and 15. Panicoideae; Panicodae; Paniceae. 11 species. Tropical Africa, Asia. Mesophytic; in shade, or in open habitats (usually: savanna, often weedy); glycophytic. Namibia, Botswana, Transvaal, Orange Free State, Swaziland, Natal, Lesotho, and Cape Province. 6 indigenous species.

References. 1. Chippindall. 1955. Gr. & Past. 2. Clayton & Renvoize. 1982. FTEA.

Species treatment by M. Koekemoer.

- 1(0). Lower glume $1/3$ – $1/2$ the spikelet length; plants annual; spikelets usually glabrous . ***U. panicoides***
 Lower glume $2/3$ to as long as the spikelet; plants annual or perennial; spikelets glabrous or pubescent 2
- 2(1). Plants annual 3
 Plants perennial 4
- 3(2). Lower glume 3-nerved, the middle nerve with 1–5 stiff hairs on the back, the tip broadly rounded or truncate ***U. trichopus***
 Lower glume 5-nerved, without stiff hairs on the back, the tip narrowly rounded ***U. brachyura***
- 4(2). Lower glume 5-nerved; spikelets lanceolate; basal sheaths densely hairy, old sheaths splitting into fibres; plants rhizomatous ***U. oligotricha***
 Lower glume 3-nerved; spikelets ovate to broadly lanceolate; basal sheaths glabrous to densely hairy, rarely splitting into fibres; plants stoloniferous . 5
- 5(4). Awn on upper lemma well developed, 0.5–1.2 mm long; plants 200–1500 mm tall; spikelets neatly arranged in two rows on the rachis; lower glume with 1–3 stiff hairs on the back ***U. mosambicensis***
 Awn on upper lemma reduced, less than 0.5 mm long; plants to 300 mm tall; spikelets usually untidily arranged on the rachis; lower glume without stiff hairs on the back ***U. stolonifera***



***Urochloa brachyura* (Hack.) Stapf**

Annual; coarsely tufted (culms erect or geniculate ascending); 200–1200 mm tall. Leaf blades 30–300 mm long; 3–16 mm wide. Spikelets 3.5–6 mm long. Racemes (2–)5–6(–10), 10–60 mm long; spikelets narrowly ovate; lower glume $2/3$ the spikelet length, 5-nerved, tip narrowly rounded and without stiff hairs on the back; upper lemma shortly mucronate, mucro about 1 mm long.



Flowering October to April. Usually on black turf and clayey soils in woodlands or grassveld, often in the shade. Common. Biome: Savanna, Grassland, and Nama-Karoo. Tropical east Africa. Closely related to *U. trichopus*, which has 3-nerved lower glumes that have stiff hairs on the back.

Description: Stapf 1920 (592), Chippindall 1955 (384), Clayton et al. 1970–1982 (606). Voucher: Tinley 1308. PRECIS code 9901100–00200.

***Urochloa mosambicensis* (Hack.) Dandy**

(=*U. pullulans* Stapf) 2; (= *U. rhodesiensis* Stent) 2.

Fig. 231. Pl. 212.



Perennial; stoloniferous and tufted (sometimes rooting and branching from the lower nodes); 200–1500 mm tall. Leaf blades 20–300 mm long; 3–20 mm wide. Spikelets 3–5 mm long. Basal sheaths glabrous or hairy, usually not splitting into fibres; racemes (2–)3–15, 20–80 mm long; lower glume 3-nerved with 1–3 stiff hairs on the back; awn of upper lemma well developed, 0.5–1.2 mm long.

Flowering October to May. On a variety of soil types, usually in sheltered disturbed places. Common. Biome: Savanna and Grassland. Tropical east Africa. Pasture (introduced forage crop in tropical countries). Closely related to *U. stolonifera*, which is a smaller plant with spikelets untidily arranged and the upper lemma very shortly awned. Not always clearly distinguished from *U. oligotricha*, because of the presence of intermediates.

Description: Chippindall & Crook 1976 (234), Chippindall 1955 (382), Clayton et al. 1970–1982 (603). Illustration: Chippindall 1955 (fig. 327). Voucher: Smook 5389. PRECIS code 9901100–00400.

***Urochloa oligotricha* (Fig. & De Not.) Henr.**

(=*U. bolhodes* (Steud.) Stapf) 2.



Perennial; rhizomatous (rhizomes stout, sometimes shortly creeping); 600–1000 mm tall. Leaf blades 50–100 mm long; 6–12 mm wide. Spikelets 3–5 mm long. Basal sheaths very densely hairy, old sheaths splitting into fibres; racemes 5–20, 30–100 mm long; spikelets lanceolate; lower glume 5-nerved; upper lemma with mucro 0.3–0.5 mm long.

Flowering December to May. Wooded grassland, roadsides and old farmland, often in wet areas on clay or loam. Locally common. Biome: Savanna and Grassland. Tropical east Africa to Ethiopia. Natural pasture and weed (in disturbed areas). Distinguished from *U. mosambicensis* and *U. stolonifera* by 5-nerved lower glumes, lanceolate spikelets and fibrous old leaf sheaths; however, intermediates with *U. mosambicensis* are present.

Description: Stapf 1920 FTA (593), Chippindall & Crook 1976 (234), Chippindall 1955 (384), Clayton et al. 1970–1982 (606). Voucher: Giess 7784. PRECIS code 9901100–00450.

Fig. 231. *Urochloa mosambicensis*

***Urochloa panicoides* Beauv.**

(=*U. ruschii* sensu Chippind., non Pilg.) 2.

Annual; tufted (erect or prostrate; often spreading cartwheel-like); 100–900 mm tall. Leaf blades 20–250 mm long; 5–18 mm wide. Spikelets (2.5–)3.5–4.5(–5.5) mm long. Inflorescence of 2–7(–10) racemes, 10–90 mm long; lower glume less than 1/2 the spikelet length; cross-veins often present on upper glume and lemmas; awn on upper lemma 0.3–1.0 mm long.

Flowering October to May. Weedy or overgrazed places and in gardens and cultivation. Common. Biome: Savanna, Grassland, and Nama-Karoo. Northwards to Sudan and Yemen and in India. Introduced to Australia. Weed (widespread in gardens and in cultivation). Easily distinguished from other annual *Urochloa* species by its shorter lower glume and glabrous spikelets.

Description: Chippindall & Crook 1976 (235), Chippindall 1955 (385), Clayton et al. 1970–1982 (602). Illustration: Chippindall 1955 (fig. 328). Voucher: Smook 4619, Smook & Gibbs Russell 2486. PRECIS code 9901100–00500.

***Urochloa stolonifera* (Goossens) Chippind.**

Perennial; rhizomatous (root-stock almost woody), or stoloniferous and tufted (with basal nodes swollen); 100–300 mm tall. Leaf blades 40–130 mm long; 2–9 mm wide. Spikelets 2.5–3.0 mm long. Racemes 2–6, 10–40 mm long; spikelets untidily arranged on rachis; lower glume 3-nerved, without stiff hairs on the back; awn of upper lemma reduced, less than 0.5 mm long.

Flowering December to April. On sandy or calcareous soils near rivers or pans, often in disturbed places. Infrequent. Biome: Savanna. Closely related to *U. mosambicensis*, which is a larger plant with the spikelets neatly arranged in two rows and has a longer awn on the upper lemma.

Description: Chippindall 1955 (381). Illustration: Chippindall 1955 (fig. 326). Voucher: Zwanziger 520. PRECIS code 9901100–00700.

***Urochloa trichopus* (Hochst.) Stapf**

(=*U. engleri* Pilg.) 2.

Annual; coarsely tufted (usually erect with few flowering culms); 200–1700 mm tall. Leaf blades 50–300 mm long; 5–20 mm wide. Spikelets 2.5–5.5 mm long. Racemes 3–20, 10–140 mm long; spikelets ovate; lower glume 2/3 the spikelet length, 3-nerved, tip broadly rounded or truncate with a tuft of 1–5 stiff hairs on the middle nerve, 1/3 from the tip; upper lemma with mucro 0.5–1.0 mm long.

Flowering December to April. Usually on sandy soils in wooded grassland or on floodplains and riverbanks, often in cultivated lands. Locally common. Biome: Savanna. Eastern tropical Africa to Yemen. Closely related to *U. brachyura*, which has 5-nerved lower glumes that lack stiff hairs on the back.

Description: Stapf 1920 (589), Chippindall 1955 (384), Clayton et al. 1970–1982 (604). Illustration: Clayton et al. 1970–1982 (fig. 141). Voucher: De Winter & Wiss 4163. PRECIS code 9901100–00800.

***Vetiveria* Bory**

Mandelornia Steud., *Lenormandia* Steud.

Perennial (with aromatic roots); forming large clumps from stout rhizomes. Culms 500–3000 mm high; herbaceous; unbranched above. Leaf blades linear. *Ligule a fringed membrane to a fringe of hairs*. Plants bisexual, with bisexual spikelets; with hermaphrodite florets. The spikelets of sexually distinct forms on the same plant (hermaphrodite and male or neuter); homomorphic.

Inflorescence of spike-like main branches, or panicle (a panicle with slender, whorled, simple or rarely compound racemes); open; espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (these with many spikelet pairs); with very slender rachides; disarticulating at the joints.

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets male-only, or sterile, similar to the sessile ones, or slightly smaller. Female-fertile spikelets 4.5–10 mm long; compressed laterally; falling with the glumes (and with the joint and pedicel). Glumes two; more or less equal; awned (G2, sometimes), or awnless; very dissimilar (lower rounded on back, upper naviculate). Proximal incomplete florets 1; epaleate; sterile.



Fig. 232. *Vetiveria nigritana*

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); incised; awnless, or mucronate, or awned. Awns when present 1; from the sinus; geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present, or absent; when present very reduced. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit small; hilum short; embryo large.

Cytology, classification, distribution. Chromosome base number, $x = 5$ and 10. Panicoideae; Andropogonodae; Andropogoneae; Andropogoninae. 10 species. Tropical Africa, Asia, Australia. Helophytic; floodplains and streambanks; glycophytic. Namibia and Botswana. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

Vetiveria nigriflora (Benth.) Stapf

Perennial; tufted; to 3000 mm tall. Leaf blades to 90 mm long; to 7 mm wide (margins cutting). Spikelets (sessile) 5.5–7.0 mm long (pedicellate slightly shorter). Glumes dark purple, short-spiny, tips rounded.

Flowering July to June. Wet places, often on black turf soil. Infrequent. Biome: Savanna. Tropical Africa, sporadic east to the Philippines. *V. zizanioides* (L.) Nash, a native of Asia, was formerly cultivated in the Transvaal for its scented roots, and is grown elsewhere commercially to yield vetiver oil.

Description: Chippindall 1955 (469), Clayton et al. 1970–1982 (739). Illustration: Chippindall 1955 (fig. 385). Voucher: De Winter & Wiss 4125. PRECIS code 9900490–00100.

Vossia Wall. & Griff.

Perennial; long-rhizomatous. Culms 1000–2000 mm high (above the water — from floating culms up to 7 m long); herbaceous (aquatic, often floating, propagating from stem fragments). *Leaf blades broad; flat. Ligule a fringed membrane. Plants bisexual, with bisexual spikelets.* The spikelets of sexually distinct forms on the same plant, or all alike in sexuality (the pedicellate spikelets hermaphrodite or male); homomorphic.

Inflorescence of spike-like main branches (rarely a single 'raceme'); digitate or subdigitate (usually); espatheate; not comprising 'partial inflorescences' and foliar organs. Spikelet-bearing axes 'racemes' (spiciform, subcylindrical or flattened, with 12 or more internodes); clustered; with substantial rachides; disarticulating at the joints (but rachis not very fragile).

Spikelets in pairs; consistently in 'long-and-short' combinations; these pedicellate/sessile. Pedicels free of the rachis. The sessile spikelets hermaphrodite. The pedicellate spikelets hermaphrodite, or male-only. Female-fertile spikelets 6–8 mm long; compressed dorsiventrally; falling with the glumes (falling with the adjacent joint and pedicel). Glumes two; very unequal; awned (or at least, G1 long-caudate, the tail flat); very dissimilar (G1 leathery, flat-backed, caudate-acuminate, 2-keeled, G2 thinner, naviculate). *Proximal incomplete florets 1; paleate, palea fully developed; male. The proximal lemmas 2 nerved.*

Female-fertile florets 1. Lemmas less firm than the glumes (hyaline); entire; awnless. Palea present; relatively long. Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous.

Cytology, classification, distribution. Panicoideae; Andropogonodae; Andropogoneae; Rottboelliinae. 1 species. Tropical Africa and Asia. Hydrophytic, or helophytic; open habitats (swamps and river margins); glycophytic. Namibia and Botswana. 1 indigenous species.

References. 1. Clayton & Renvoize. 1982. FTEA.

Species treatment by G.E. Gibbs Russell.

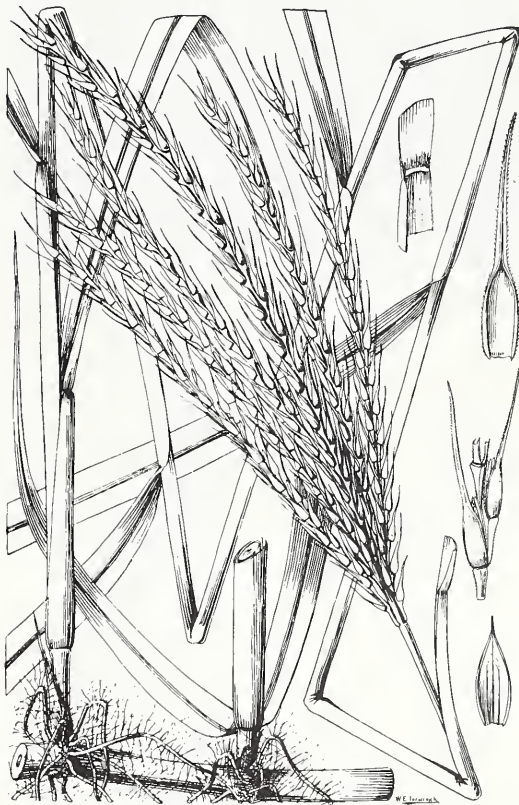


Fig. 233. *Vossia cuspidata*

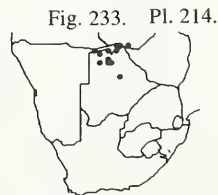
Vossia cuspidata (Roxb.) Griff.

Hippo grass.

Perennial; hydrophyte; 1000–2000 mm tall (above water, submerged culms to 5000 mm long). Leaf blades 300–1000 mm long; 6–18 mm wide. Spikelets (sessile) 20–40 mm long (pedicellate a little smaller). Lower glume of sessile spikelets with a long flattened awn-like tail.

Flowering August to May. In permanent rivers and lakes. Rare, but locally dominant (at riverbanks). Biome: Savanna. Throughout tropical Africa, India. Weed.

Description: Clayton et al. 1970–1982 (832). Illustration: Clayton et al. 1970–1982 (fig. 193). Voucher: Gibbs Russell 2807. PRECIS code 9900160–00100.



Vulpia C. Gmelin

Chloammia, *Distomomischus* Dulac, *Festucaria* Link, *Loretia* Duval-Jouve, *Mygalurus* Link, *Narduretia* Villar, *Nardurus* (Bluff, Nees & Schauer) Reichenb., *Prosphysis* Dulac, *Zerna* Panzer.

Annual, or perennial (rarely); caespitose. Culms 50–900 mm high; herbaceous; unbranched above. Leaf blades linear; flat, or rolled (convolute when dry). *Ligule an unfringed membrane*. Plants without hidden cleistogenes (but all the spikelets often cleistogamous).

Inflorescence a single raceme (rarely), or paniculate; open, or contracted; espatheate. Spikelet-bearing axes persistent.

Spikelets secund (usually, more or less); 5–16 mm long; compressed laterally; disarticulating above the glumes (also, sometimes at the base of the pedicel). *Glumes* two; *very unequal*; markedly shorter than the spikelets; awned (G₂, sometimes), or awnless; *very dissimilar (usually—G₁ often minute, G₂ acute to acuminate)*. Incomplete florets distal to the female-fertile florets; proximal incomplete florets absent.

Female-fertile florets 2–15 (rarely only 1). Lemmas decidedly firmer than the glumes (chartaceous, with thin margins); 3–5 nerved; entire; awned. Awns 1; median; api-

cal; non-geniculate; much shorter than the body of the lemma, to much longer than the body of the lemma. Palea present; relatively long. Lodicules 2; membranous; glabrous. Stamens 1–2 (rarely 3). Ovary glabrous, or hairy. Fruit small, or medium sized, or large; hilum long-linear; embryo small.

Cytology, classification, distribution. Chromosome base number, $x = 7$. Pooideae; Poodae; Poeae. 23 species. Temperate. Mesophytic, or xerophytic; in open habitats; maritime-arenicolous (sometimes), or glycophytic. Transvaal, Orange Free State, Natal, Lesotho, and Cape Province. 4 naturalized species.

Intergeneric hybrids with *Festuca* — *X Festulpia* Melderis ex Stace & R. Cotton (several species involved).

References. 1. Chippindall. 1955. Gr. & Past. 2. Linder. Unpubl. ms, FSA.

Species treatment by M. Koekemoer.

- 1(0). Upper glume awned, 12–16 mm long (excluding awn); awn 10–20 mm long; callus pointed *V. fasciculata*
Upper glume acute or very shortly awned, 3–10 mm long (excluding awn); awn to 2 mm long when present; callus rounded 2
- 2(1). Inflorescences partially enclosed in the uppermost leaf sheaths; lower glume often scale-like or to nearly 1/2 as long as the upper glume *V. myuros*
Inflorescences well exerted from the leaf sheaths; lower glume 1/4–3/4 as long as the upper glume 3
- 3(2). Lower glume 1/2–3/4 as long as the upper glume; spikelets usually secund and often almost perpendicular to the central axis *V. bromoides*
Lower glume 1/4–1/2 as long as the upper glume; spikelets mostly appressed to central axis *V. muralis*

Vulpia bromoides (L.) S.F. Gray

Squirreltail fescue.

Annual; culms solitary or numerous and then loosely tufted; 50–600 mm tall. Leaf blades 100–200 mm long; 0.5–3.0 mm wide. Spikelets 7–14 mm long (excluding awns). Inflorescence 20–120 mm long, to 15 mm wide, well exerted from the uppermost leaf sheath; spikelets usually secund and often almost perpendicular to the central axis; lower glume 1/2–3/4 as long as upper; upper glume 3–10 mm long, acute or shortly awned; callus of lemma rounded.

Flowering August to January. In weedy and disturbed rocky places such as roadsides and along streams. Locally common. Naturalized from Europe. Biome: Fynbos, Savanna and Nama-Karoo. Naturalized worldwide. There are many overlapping characters between this species, *V. muralis* and *V. myuros*, but *V. bromoides* can be distinguished by its longer lower glumes and spikelets that are often almost perpendicular to the central axis.

Description: Linder (26), Stapf 1898–1900 (725), Chippindall 1955 (60), Clayton et al. 1970–1982 (64). Illustration: Chippindall 1955 (fig. 31), Clayton et al. 1970–1982 (fig. 22). Voucher: Smook 3675. PRECIS code 9904180–00100.



Fig. 234. *Vulpia myuros*

***Vulpia fasciculata* (Forssk.) Samp.**

Annual; culms solitary or loosely tufted; 100–450 mm tall. Leaf blades 30–250 mm long; 2–5 mm wide. Spikelets 10–20 mm long (excluding awns). Inflorescence partially exerted from the uppermost leaf sheath; glumes unequal, lower glume 0.5–2.0 mm long; upper glume 12–16 mm long; awned, awn 10–20 mm long; callus of lemma pointed.

Flowering October to November. In weedy and disturbed places such as gardens and roadsides, also in coastal dunes with other alien plants. Locally common. Biome: Fynbos. Naturalized from the coastal areas of southern and western Europe. The long-awned upper glume uniquely distinguishes this species from other *Vulpia* species in southern Africa.

Description: Linder (25). Voucher: Smook 3714. PRECIS code 9904180–00150.

***Vulpia muralis* (Kunth) Nees**

Annual; culms solitary or loosely tufted; 60–700 mm tall. Leaf blades 1–3 mm wide. Spikelets 5–10 mm long (excluding awns). Inflorescence 20–160 mm long, well exerted from the uppermost leaf sheath; spikelets usually appressed to the central axis; lower glume 1/4–1/2 as long as upper; upper glume 3–10 mm long, acute; callus of lemma rounded.

Flowering September to December. Generally in dry habitats on calcareous or limestone soils and in disturbed areas such as road verges. Locally common. Naturalized from Europe. Biome: Fynbos and Grassland. Introduced to the Mediterranean and the New World. Very similar to *V. bromoides* and *V. myuros*, with which it shares many overlapping characters. Distinguished only by the key characters.

Description: Bor 1985 (1732), Linder (27). Voucher: Smook 3693. PRECIS code 9904180–00200.

***Vulpia myuros* (L.) C. Gmel.**

Ratstail fescue, langbaard-swenkgras.

Annual; tufted (culms usually densely fascicled); 50–700 mm tall. Leaf blades 20–150 mm long; 0.5–3.0 mm wide. Spikelets 6–10 mm long (excluding awns). Inflorescence 50–120 mm long, partially enclosed in uppermost leaf sheath; spikelets usually appressed to the central axis; lower glume 0.5–2.0 mm long, often scale-like but to nearly 1/2 as long as upper; upper glume 3–6 mm long, acute; callus of lemma rounded.

Flowering September to November. Disturbed places in wet or damp areas but extending also to the more arid regions. Locally common. Naturalized from western, central and southern Europe. Biome: Fynbos, Grassland, and Succulent Karoo. Introduced worldwide in temperate regions. Distinguished from *V. bromoides* and *V. muralis* by the key characters only.

Description: Bor 1985 (1733), Linder (28), Stapf 1898–1900 (724), Chippindall 1955 (61), Clayton et al. 1970–1982 (64). Illustration: Chippindall 1955 (fig. 32). Voucher: Acocks 16522. PRECIS code 9904180–00300.

***Willkommia* Hack.**

Willbleibia Herter.

Annual, or perennial; long-stoloniferous, or caespitose. Culms 200–400 mm high; herbaceous; unbranched above. Leaf blades linear; flat. *Ligule a fringe of hairs*.

Inflorescence of spike-like main branches; non-digitate (spikes scattered along a central axis); espatheate. Spikelet-bearing axes persistent.

Spikelets biseriate; about 4 mm long; compressed dorsiventrally; disarticulating above the glumes. Glumes two; very unequal (G1 about two-thirds length of G2); long relative to the adjacent lemmas (i.e., the upper glumes, which slightly exceed the spikelet); awnless; similar (thin; G1 flimsier). All florets female-fertile; proximal incomplete florets absent.

Female-fertile florets 1. Lemmas less firm than the glumes to similar in texture to the glumes; without a germination flap; 3 nerved; entire; awnless (but acuminate), or awned. Awns when present 1; apical; non-geniculate; much shorter than the body of the lemma. Palea present; relatively long (glabrous or silky-hairy). Lodicules 2; fleshy; glabrous. Stamens 3. Ovary glabrous. Fruit ellipsoid; hilum short; embryo large.



Fig. 235. *Willkommia sarmentosa*

Fig. 234. Pl. 215.

Photosynthetic pathway and related features. C₄; XyMS+.

Cytology, classification, distribution. Chloridoideae; Chlorideae *sensu lato*. 4 species, 1 in southern U.S.A., 3 in southern Africa. Xerophytic; sandy savanna. Usually halophytic. Namibia and Botswana. 3 indigenous species.

References. 1. Launert. 1970. FSWA. 2. Clayton & Renvoize. 1986. Gen. Gram.

Species treatment by L. Smook.

- 1(0). Racemes several, closely arranged on the central axis; spikelets elliptic **W. newtonii**
Racemes few (occasionally several), distant from one another on the central axis; spikelets narrowly elliptic 2
2(1). Plants annual **W. annua**
Plants perennial **W. sarmentosa**

Willkommia annua Hack.

Annual; tufted; to 600 mm tall. Leaf blades to 30 mm long; 1.5–2.5 mm wide. Spikelets 4–5 mm long. Leaf margins thickened, cilia present on margins, far apart; inflorescence with a few racemes well apart from each other on the central axis; spikelets narrowly elliptic, green; upper glume scaberulous, especially at the apex.

Flowering January. Moist, sandy, often halophytic soils. Infrequent. Biome: Savanna. Possibly in Angola. Barely distinguished from the perennial *W. sarmentosa*.

Description: Hackel 1888 in Verh. Bot. Ver. Brand. (30: 146). Voucher: Barnard 16495. PRECIS code 9903100–00100.



Pl. 216.

Willkommia newtonii Hack.

Perennial (subperennial); stoloniferous and tufted (geniculate at base); to 500 mm tall. Leaf blades to 20 mm long; 3.0–3.5 mm wide. Spikelets 2.5–3.0 mm long. Leaf margins with long cilia close together; inflorescence with several racemes closely associated on the central axis so that the axis is not easily visible between each raceme; spikelets elliptic, sometimes flushed purple, with long cilia on the central nerve of the upper glume or if these absent with large prickles near the apex, occasionally with hairs on the upper glume.

Flowering March to April. Sandy soils in clearings between tall trees. Rare. Infrequent. Biome: Savanna. Angola. Barely distinguishable from *W. sarmentosa*, which has fewer racemes arranged well apart on the central axis and narrowly elliptic spikelets. Intermediates have been found. The genus is in need of revision.

Description: Hackel 1896 Bull. Herb. Boiss. Ser 1,10 (810). Voucher: Giess 9305. PRECIS code 9903100–00200.



Willkommia sarmentosa Hack.

(=*Craspedorhachis sarmentosa* (Hack.) Pilg.) 2.

Perennial; stoloniferous and tufted (mat-forming); to 800 mm tall. Leaf blades to 110 mm long (usually shorter); to 5 mm wide. Spikelets 4–5 mm long; 0.5–0.9 mm wide. Leaves usually glaucous, leaf margins thickened and with long cilia that are far apart or only occasional; inflorescence usually with only a few racemes distant from each other; spikelets narrowly elliptic, green; upper glume scaberulous with minute prickles especially near the apex.

Flowering November to March (and July). Moist sandy, often halophytic soils along edges of pans and marshes, or seasonally waterlogged areas. Locally common. Biome: Savanna. Zimbabwe, Zambia. *W. annua* is can be recognized as an annual form, but *W. newtonii* is barely distinguishable and intermediates are found. The genus is in need of revision.

Description: Launert 1970 (160:49), Chippindall 1955 (204). Illustration: Chippindall 1955 (fig. 181). Voucher: Giess & Muller 13953. PRECIS code 9903100–00300.



Fig. 235.

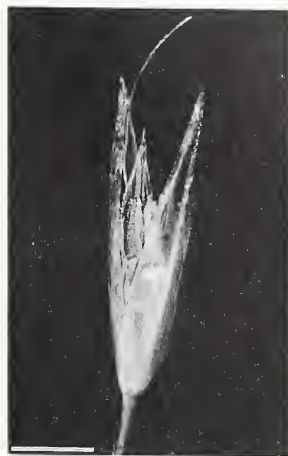
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Pl. 1. *Acrachne racemosa*,
6-9 mm



Pl. 2. *Acroceras macrum*,
4-5 mm



Pl. 3. *Agrostis eriantha*,
3.5-5.0 mm



Pl. 4. *Aira cupaniana*,
2-3 mm



Pl. 5. *Alloteropsis semialata*
subsp. *eckloniana*, 5-8 mm
(side view)



Pl. 6. *Alloteropsis semialata*
subsp. *eckloniana*, 5-8 mm
(abaxial view)



Pl. 7. *Ammophila arenaria*,
10-15 mm



Pl. 8. *Andropogon chinensis*,
5-7 mm (spikelet pair)



Pl. 9. *Anthephora ramosa*,
6-7 mm (spikelet cluster)



Pl. 10. *Anthephora schinzii*,
to 10 mm (spikelet cluster)



Pl. 11. *Anthoxanthum ecklonii*,
6-8 mm



Pl. 12. *Aristida adscensionis*,
10-40 mm (incl. awns)



Pl. 13. *Arrhenatherum elatius*,
7-11 mm



Pl. 14. *Arthraxon lanceolatus*,
5.0-6.5 mm (spikelet pair)



Pl. 15. *Arundinella nepalensis*,
4-6 mm



Pl. 16. *Arundo donax*,
8-15 mm



Pl. 17. *Avena barbata*,
18-26 mm



Pl. 18. *Axonopus affinis*,
2 mm

scale bar = 1 mm



Pl. 19. *Bambusa balcooa*,
7-16 mm



Pl. 20. *Bewsia biflora*,
5.5-9.0 mm



Pl. 21. *Bothriochloa insculpta*,
4.5-5.0 mm (spikelet pair)



Pl. 22. *Brachiaria brizantha*,
4-6 mm



Pl. 23. *Brachiaria deflexa*,
2.0-3.4 mm (spikelet pair)



Pl. 24. *Brachiaria serrata*,
2.3-4.5 mm



Pl. 25. *Brachyachne
patentiflora*, 3.0-4.4 mm



Pl. 26. *Brachychloa
schiemaniana*, 4-7 mm



Pl. 27. *Brachypodium flexum*,
12-44 mm



Pl. 28. *Briza maxima*,
8-25 mm



Pl. 29. *Briza subaristatum*,
4-5 mm



Pl. 30. *Bromus catharticus*,
20-35 mm



Pl. 31. *Calamagrostis epigeios*
var. *capensis*, 5.5-8.0 mm



Pl. 32. *Catalepis gracilis*,
4-5 mm



Pl. 33. *Catapodium rigidum*,
5-7 mm



Pl. 34. *Cenchrus ciliaris*,
4-5 mm (spikelet cluster)



Pl. 35. *Centropodia glauca*,
7.5-10.0 mm



Pl. 36. *Chaetobromus*
dregeanus, 12-18 mm

scale bar = 1 mm



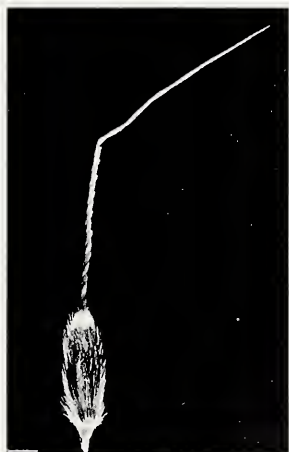
Pl. 37. *Chloris virgata*,
3.0-3.5 mm



Pl. 38. *Chrysopogon
serrulatus*, 5-8 mm (triad
of spikelets)



Pl. 39. *Cladoraphis spinosa*,
6-18 mm



Pl. 40. *Cleistachne sorghoides*,
4-5 mm



Pl. 41. *Coelachyrum
yemenicum*, 5-10 mm



Pl. 42. *Coelorhachis capensis*,
4.5-5.0 mm (spikelet pair)



Pl. 43. *Coix lacryma-jobi*,
25-35 mm (partial
inflorescence)



Pl. 44. *Colpodium hedbergii*,
2.5-4.0 mm (three
spikelets)



Pl. 45. *Cortaderia selloana*,
to 15 mm



Pl. 46. *Corynephorus fasciculatus*, to 3 mm



Pl. 47. *Craspedorhachis africana*, 3-4 mm (several spikelets)



Pl. 48. *Ctenium concinnum*, 5-7 mm



Pl. 49. *Cymbopogon marginatus*, 5.0-6.5 mm (spikelet pair)



Pl. 50. *Cynodon dactylon*, 2.0-2.5 mm (several spikelets)



Pl. 51. *Cynosurus coloratus*, 10-25 mm



Pl. 52. *Dactylis glomerata*, 5-9 mm



Pl. 53. *Dactyloctenium giganteum*, 4.0-6.2 mm



Pl. 54. *Danthoniopsis dinteri*, 14-20 mm

scale bar = 1 mm



Pl. 55. *Deschampsia cespitosa*,
3.5-6.0 mm



Pl. 56. *Diandrochloa namaquensis*, 2-3 mm
(several spikelets)



Pl. 57. *Dichanthium annulatum*, 2.5-5.0 mm
(spikelet pair)



Pl. 58. *Digitaria eriantha*,
2.2-4.0 mm (two spikelets)



Pl. 59. *Digitaria monodactyla*,
2.8-3.2 mm (abaxial view)



Pl. 60. *Diheteropogon amplexans*, 7-9 mm
(spikelet pair)



Pl. 61. *Dinebra retroflexa*,
5.7-9.0 mm (several
spikelets)



Pl. 62. *Diplachne fusca*,
6-14 mm



Pl. 63. *Dregeochloa pumila*,
9-13 mm

scale bar = 1 mm



Pl. 64. *Echinochloa crus-galli*,
3-7 mm



Pl. 65. *Ehrharta calycina*,
4.0-8.5 mm



Pl. 66. *Ehrharta capensis*,
8-12 mm



Pl. 67. *Ehrharta longiflora*,
10-25 mm (incl. awns)



Pl. 68. *Eleusine coracana*
subsp. *africana*, 5-8 mm



Pl. 69. *Elionurus muticus*,
6-14 mm (spikelet pair)



Pl. 70. *Elymandra grallata*,
6.5-12.0 mm (spikelet pair)



Pl. 71. *Elytrigia repens*,
10-20 mm



Pl. 72. *Elytrophorus*
globularis, 4-7 mm

scale bar = 1 mm



Pl. 73. *Enneapogon cenchroides*, 3-5 mm



Pl. 74. *Enteropogon macrostachyus*, 8-10 mm



Pl. 75. *Entolasia imbricata*, 4.5-6.5 mm



Pl. 76. *Entoplocamia aristulata*, 9-17 mm



Pl. 77. *Eragrostis capensis*, 3.5-15.0 mm



Pl. 78. *Eragrostis curvula*, 4-10 mm



Pl. 79. *Eragrostis racemosa*, 3-10 mm



Pl. 80. *Eragrostis superba*, 6-16 mm



Pl. 81. *Eriochloa meyeriana* subsp. *meyeriana*, 2.5-3.5 mm



Pl. 82. *Eriochrysis pallida*,
3.5-5.0 mm (spikelet pair)



Pl. 83. *Eulalia villosa*,
5-7 mm (spikelet pair)



Pl. 84. *Eustachys paspaloides*,
1.5-2.5 mm



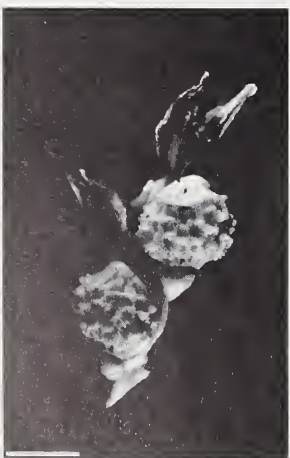
Pl. 85. *Festuca costata*,
10-20 mm



Pl. 86. *Fingerhuthia africana*,
4.0-5.5 mm



Pl. 87. *Gastridium phleoides*,
5-7 mm (two spikelets)



Pl. 88. *Hackelochloa granularis*, 1.0-1.5 mm
(two spikelet pairs)



Pl. 89. *Hainardia cylindrica*,
5-8 mm (several spikelets)



Pl. 90. *Harpochloa falx*,
6-9 mm

scale bar = 1 mm



Pl. 91. *Helictotrichon turgidulum*,
10-12 mm



Pl. 92. *Hemarthria altissima*,
5-7 mm (two spikelet pairs)



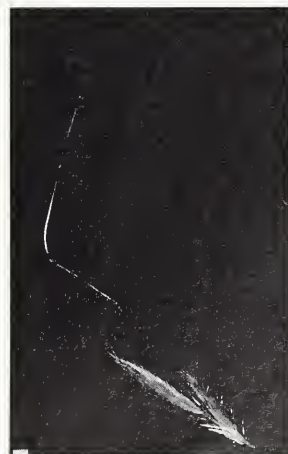
Pl. 93. *Heteropogon contortus*,
5.5-7.0 mm (spikelet pair)



Pl. 94. *Holcus lanatus*,
3-4 mm



Pl. 95. *Hordeum murinum*,
20-35 mm (incl. awns
and sterile spikelets)



Pl. 96. *Hyparrhenia hirta*,
4.0-6.5 mm (spikelet pair)



Pl. 97. *Hyperthelia dissoluta*,
6.5-7.5 mm (spikelet pair)



Pl. 98. *Imperata cylindrica*,
3-6 mm (spikelet pair)



Pl. 99. *Ischaemum afrum*,
5-8 mm (spikelet pair)



Pl. 100. *Kaokochloa nigrirostris*, to 7 mm



Pl. 101. *Karroochloa purpurea*, 5-7 mm



Pl. 102. *Koeleria capensis*, 3.5-4.0 mm



Pl. 103. *Lagurus ovatus*, 7-10 mm (several spikelets)



Pl. 104. *Lamarckia aurea*, 6-9 mm



Pl. 105. *Leersia hexandra*, 3.4-4.8 mm



Pl. 106. *Leptocarydion vulpiastrum*, 5-11 mm



Pl. 107. *Leptochloa panicea*, 1.9-2.5 mm



Pl. 108. *Lepturus repens*, 10-14 mm (incl. awns)

scale bar = 1 mm



Pl. 109. *Leucophrys mesocoma*, to 7 mm



Pl. 110. *Lintonia nutans*, 6-10 mm



Pl. 111. *Lolium multiflorum*, 8-20 mm



Pl. 112. *Lophachme digitata*, 5-6 mm



Pl. 113. *Lophochloa pumila*, 2.5-4.0 mm



Pl. 114. *Loudetia simplex*, 7-13 mm



Pl. 115. *Megaloprotachne albescens*, 4.0-4.5 mm (two spikelets)



Pl. 116. *Megastachya mucronata*, 7-15 mm



Pl. 117. *Melica racemosa*, 5-9 mm



Pl. 118. *Melinis minutiflora*,
1.5-2.0 mm (several
spikelets)



Pl. 119. *Melinis repens*
subsp. *repens*, 2.2-4.0 mm



Pl. 120. *Merxmuellera*
arundinacea,
13.5-16.5 mm



Pl. 121. *Merxmuellera stricta*,
to 23 mm



Pl. 122. *Microchloa caffra*,
3.0-5.5 mm (several
spikelets)



Pl. 123. *Microlaena stipoides*,
20-30 mm (incl. awns)



Pl. 124. *Microlaena stipoides*,
9-11 mm (excl. awns)



Pl. 125. *Microstegium nudum*,
3.5-4.5 mm (terminal
spikelets)



Pl. 126. *Miscanthus capensis*,
4-6 mm

scale bar = 1 mm



Pl. 127. *Monelytrum luederitzianum*,
3-4 mm (spikelet cluster)



Pl. 128. *Monocymbium cerasiiforme*,
3.5-4.0 mm (spikelet pair)



Pl. 129. *Mosdenia leptostachys*, 2.5-3.7 mm



Pl. 130. *Nassella trichotoma*,
6.0-8.5 mm



Pl. 131. *Odontelytrum abyssinicum*, to 12 mm



Pl. 132. *Odysea paucinervis*,
5-9 mm



Pl. 133. *Olyra latifolia*,
7-10 mm



Pl. 134. *Oplismenus hirtellus*,
2-4 mm



Pl. 135. *Oropetium capense*,
2.5-4.0 mm (rachis and
several spikelets)



Pl. 136. *Oryza longistaminata*,
7-9 mm



Pl. 137. *Oryzidium barnardii*,
8-10 mm



Pl. 138. *Oxyrhachis gracillima*, 3-6 mm
(spikelet pair)



Pl. 139. *Panicum maximum*,
2.5-3.0 mm



Pl. 140. *Panicum natalense*,
1.7-2.2 mm (several spikelets)



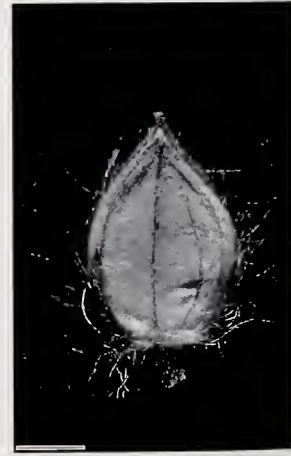
Pl. 141. *Parapholis incurva*,
4.5-5.5 mm (several spikelets)



Pl. 142. *Paratheria prostrata*,
to 9 mm



Pl. 143. *Paspalidium obtusifolium*, 3.0-3.5 mm



Pl. 144. *Paspalum dilatatum*,
3-4 mm

scale bar = 1 mm



Pl. 145. *Pennisetum setaceum*,
4.0-6.5 mm (spikelet
cluster)



Pl. 146. *Pentameris thuarii*,
16-22 mm



Pl. 147. *Pentaschistis
curvifolia*,
11-14 mm



Pl. 148. *Pentaschistis galpinii*,
4-6 mm



Pl. 149. *Pentaschistis pusilla*,
2-4 mm



Pl. 150. *Perotis patens*,
1.2-2.7 mm



Pl. 151. *Phacelurus franksae*,
6-8 mm (spikelet pair)



Pl. 152. *Phalaris aquatica*,
4.5-7.5 mm



Pl. 153. *Phragmites australis*,
12-18 mm



Pl. 154. *Poa annua*,
4-6 mm



Pl. 155. *Pogonarthria*
squarrosa, 3.3-7.8 mm



Pl. 156. *Polevansia rigida*,
3.5-4.5 mm



Pl. 157. *Polypogon*
monspeliensis,
2-3 mm (two spikelets)



Pl. 158. *Prionanthium*
pholiuroides, 3-7 mm



Pl. 159. *Prosphytochloa*
prehensilis, 6-9 mm



Pl. 160. *Pseudechinolaena*
polystachya, 3.5-5.0 mm



Pl. 161. *Pseudopentameris*
macrantha, 30-40 mm



Pl. 162. *Puccinellia*
acroxantha, 3-5 mm

scale bar = 1 mm



Pl. 163. *Rendlia altera*,
4.0-5.5 mm (several
spikelets)



Pl. 164. *Rhytachne
rottboellioides*, 3-5 mm
(spikelet pair)



Pl. 165. *Rottboellia
cochinchinensis*,
4-7 mm (spikelet pair)



Pl. 166. *Sacciolepis typhura*,
1.7-2.5 mm



Pl. 167. *Sartidia angolensis*,
90-120 mm (incl. awns)



Pl. 168. *Schismus barbatus*,
4-7 mm



Pl. 169. *Schizachyrium
sanguineum*, 6-9 mm
(spikelet pair)



Pl. 170. *Schmidtia
pappophoroides*, 8-15 mm



Pl. 171. *Schoenefeldia
transiens*, 3.5-5.0 mm



Pl. 172. *Secale africanum*,
10-15 mm



Pl. 173. *Sehima galpinii*,
12-15 mm (spikelet pair)



Pl. 174. *Setaria lindenbergiana*,
2.0-3.5 mm



Pl. 175. *Setaria sphacelata*
var. *torta*, 2.5-3.0 mm



Pl. 176. *Setaria verticillata*,
1.5-2.5 mm



Pl. 177. *Sorghastrum friesii*,
5-7 mm



Pl. 178. *Sorghum bicolor*
subsp. *arundinaceum*,
5-7 mm (spikelet pair)



Pl. 179. *Spartina maritima*,
12-15 mm



Pl. 180. *Sphenopus divaricatus*, 2-3 mm

scale bar = 1 mm



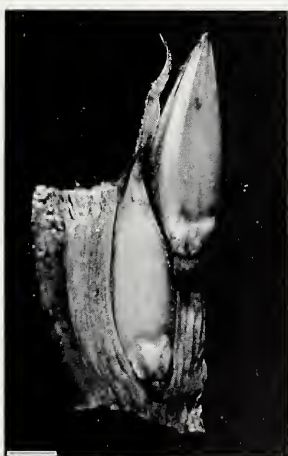
Pl. 181. *Sporobolus centrifugus*, 2.5-4.2 mm



Pl. 182. *Sporobolus discosporus*, 1.0-1.7 mm (several spikelets)



Pl. 183. *Sporobolus fimbriatus*, 1.4-2.2 mm (several spikelets)



Pl. 184. *Stenotaphrum secundatum*, 4-5 mm (two spikelets)



Pl. 185. *Stereochlaena cameronii*, 2.0-3.5 mm (two spikelets)



Pl. 186. *Stiburus alopecuroides*, 2.7-4.0 mm



Pl. 187. *Stipa dregeana* var. *elongata*, 5-7 mm



Pl. 188. *Stipagrostis anomala*, 11-14 mm



Pl. 189. *Stipagrostis uniplumis* var. *neesii*, 10.0-14.5 mm



Pl. 190. *Stipagrostis zeyheri*
subsp. *zeyheri*, 16-19 mm



Pl. 191. *Streblochaete*
longiarista, 15-25 mm



Pl. 192. *Styppeiochloa*
gynoglossa, 5-7 mm



Pl. 193. *Tarigidia*
aequiglumis, 4.0-4.5 mm



Pl. 194. *Tetrachne dregei*,
4-6 mm



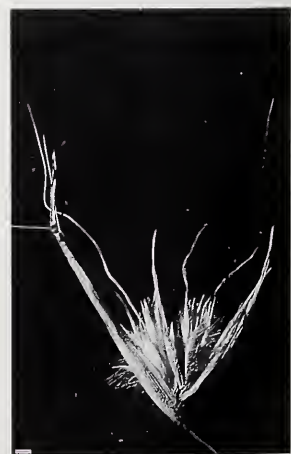
Pl. 195. *Tetrapogon tenellus*,
3.5-5.0 mm



Pl. 196. *Thamnocalamus*
tessellatus, 16-18 mm



Pl. 197. *Thelepogon elegans*,
5-13 mm (spikelet pair)



Pl. 198. *Themeda triandra*,
about 60 mm (spikelet
cluster)

scale bar = 1 mm



Pl. 199. *Themeda triandra*,
5-7 mm (spikelet pair)



Pl. 200. *Thinopyrum*
distichum, 28-40 mm



Pl. 201. *Trachypogon spicatus*,
4-8 mm (spikelet pair)



Pl. 202. *Tragus berteronianus*,
2.0-3.8 mm (spikelet
cluster)



Pl. 203. *Tribolium uniolae*,
to 6 mm



Pl. 204. *Tricholaena*
monachne, 2-3 mm



Pl. 205. *Trichoneura*
grandiglumis, 5-14 mm



Pl. 206. *Trichopteryx*
dregeana, 4-7 mm



Pl. 207. *Tripogon minimus*,
2.6-8.0 mm



Pl. 208. *Triraphis andropogonoides*,
6-10 mm



Pl. 209. *Tristachya leucothrix*,
24-45 mm (triad of spikelets)



Pl. 210. *Urelytrum agropyroides*,
7-8 mm (spikelet pair)



Pl. 211. *Urochlaena pusilla*,
to 6 mm



Pl. 212. *Urochloa mosambicensis*, 3-5 mm



Pl. 213. *Vetiveria nigritana*,
5.5-7.0 mm (spikelet pair)



Pl. 214. *Vossia cuspidata*,
20-40 mm (spikelet pair)



Pl. 215. *Vulpia myuros*,
6-10 mm



Pl. 216. *Willkommia annua*,
4-5 mm

APPENDIX 1:

SUMMARIZED CLASSIFICATION OF SOUTHERN AFRICAN GRASSES

There are few absolute criteria for reliably referring grasses to subtribes, tribes, supertribes and subfamilies. These higher levels of classification are recognisable only in terms of correlated tendencies among suites of characters. It will be apparent, therefore, that the classification provided here has no *identificatory* rôle. On the contrary, this illustrates an important general principle of taxonomy: identification is most effectively pursued at the lowest available hierarchical level. When identification has been satisfactorily achieved at the level of species or genus, using a printed key or a microcomputer cross-referenced with printed descriptions, the relationships of the organism are readily ascertained.

Detailed classificatory information, including group descriptions and diagnostic characters, are readily obtainable from the automated generic data by application of the program INTKEY. It seemed more appropriate here to present a summarized classification of the southern African grasses, with relatively brief descriptions, because the comprehensive and fully comparative descriptions derived from the complete character list are so complex as to be quite intimidating. Exclusion of genera not represented in southern Africa has permitted some simplification of the group descriptions, through omission of 'exceptional' taxa, but we have tried to ensure that the descriptions remain reasonably representative of the groups as world entities.

The characters printed in **boldface** approximate a diagnostic description for each group. It is not possible to be strictly diagnostic at these higher levels because of the paucity of absolute criteria separating the groups, as mentioned above.

The classification is intended to fulfil an introductory, educational rôle, and to provide guidance for defining appropriate samples to use in experimental work. Therefore, both 'exoteric' characters, of the kind acceptable in general purpose keys, and 'esoteric' characters (anatomy, physiology, cytology etc.) which constitute essential components of modern taxonomic classification are included. We also wished to illustrate the diversity of information that can be applied to taxonomic group-making, and to hint at the range of biological disciplines with which grass taxonomy usefully exchanges information. For this reason the descriptions summarize taxonomic patterns observable in 2c DNA values, chromosome numbers and susceptibilities to pathogens, notwithstanding that most of the available information derives from observations on species not represented in southern Africa.

Circumscriptions of the subfamilies and supertribes employed here have been discussed in detail elsewhere (Watson *et al.* 1985, Watson 1987). Apart from the placement of some controversial genera and small groups (most of which are not represented in southern Africa), these groupings are widely accepted as a reasonable taxonomic interpretation of the facts (cf. Clayton & Renvoize 1986, Soderstrom *et al.* 1987). The Centothecaceae (represented in southern Africa only by *Megastachya*) are not very convincingly bambusoid, but a better location has yet to be agreed upon. The Arundinoideae constitute an unsatisfactory subfamily which is not amenable to anything approaching a diagnostic description, and which is probably polyphyletic (see Watson *et al.* 1985 and Kellogg & Campbell 1987 for detailed analyses in phenetic and phylogenetic terms, respectively). However, the relationships of the individual arundinoid tribes with other subfamilies remain obscure. Even when their relationships are satisfactorily resolved, difficulties of practical implementation will remain. Including arundinoid tribes in other subfamilies (e.g. returning the Stipeae to the Pooideae (Clayton & Renvoize 1986)) extends the diversity of the latter so as to undermine practical usefulness; on the other hand, promoting the tribes to subfamilies amounts to a kind of nomenclatural inflation which contributes nothing to the portrayal of inter-subfamilial relationships.

The tribes used here are also fairly conventional. However, they have been subjected to original, critical (but as yet incomplete) analyses in terms of the generic descriptions (Macfarlane & Watson 1982; Watson unpublished), and those which have not proved amenable to adequate definition in terms of tangible correlations of characters have been rejected. Detailed analyses of the world data on the Andropogoneae detected ill-defined, low-

level groupings similar to those set out by Clayton (1972, 1973), which scarcely seem to merit nomenclatural recognition. However, they also revealed the "awned Andropogoneae" and the "awnless Andropogoneae" of informal parlance as rather clearly defined series, whose recognition here as subtribes reflects a genuinely informative distinction.

Pooideae

Culms 2–200 cm high; **herbaceous; unbranched above; usually with hollow internodes**. Leaf sheaths occasionally with joined margins. Leaf blades linear to linear-lanceolate; not pseudopetiolate; without readily visible transverse veins; not disarticulating. **Adaxial ligule an unfringed membrane**. Abaxial ligule absent. Inflorescence determinate; usually paniculate, occasionally a raceme, a spike or spikelet with clusters of spikelets, but **never comprising spikelike main branches; espatheate**. Spikelets hardly ever in distinct long-and-short combinations. *Female-fertile spikelets* nearly always laterally compressed or terete (dorsiventrally compressed in *Hainardia*); with or without an apically prolonged rachilla. Glumes present; usually 2 (one in *Hainardia*, *Lolium*); usually similar (dissimilar in *Vulpia*). Lower glume 1–5(–11) nerved. Upper glume 1–7(–12) nerved. Spikelets with female-fertile florets only, or having incomplete florets. Incomplete florets when present usually distal (proximal in *Anthoxanthum*, *Phalaris*). *Female-fertile florets* 1–30. Lemmas entire or incised (not deeply cleft); hairs when present neither in tufts nor in transverse rows; **without a germination flap**; (1–)3–7(–15) nerved; often awned. Lemma awns when present 1 or 3, the median (or only) awn apical, from a sinus or dorsal; geniculate or non-geniculate. Palea present, usually 2-keeled (rarely keel-less); usually apically notched. **Lodicules present; 2; usually membranous** and free (exception *Melica*); glabrous or ciliate. Ovary glabrous or hairy. Styles 2; nearly always free to their bases. Stigmas 2; white. Fruit a caryopsis, often longitudinally grooved. Hilum short or long-linear. **Embryo small; usually with an epiblast, with neither mesocotyl internode or scutellar tail, the embryonic leaf margins meeting**.

Abaxial leaf blade epidermis. Microhairs absent. Mid-intercostal long-cells more or less rectangular or (almost as often) fusiform; their walls markedly sinuous or (about as commonly) more or less straight. *Costal silica bodies* variously crescentic, tall-and-narrow or rounded, but more often 'poooid-type' (i.e. elongated, sinuous or crenate) or elongated-smooth, and **hardly ever 'panicoid-type' or saddle-shaped**. *Costal short-cells* only infrequently in long rows, usually solitary, in short rows and/or pairs. *Stomatal guard-cells* nearly always overlapped by the *interstomatals* (exception: *Vulpia*); subsidiary cells parallel-sided or dome-shaped. *Transverse section of leaf blade, physiology*. C₃. XyMS+. Blade usually adaxially ribbed, much less frequently flat; the ribs usually more or less constant in size. Mesophyll not traversed by colourless columns; without arm-cells; without fusoids. Midrib conspicuous or inconspicuous; **nearly always with a single bundle**, rarely a simple arc; without adaxial colourless tissue. Bulliforms often present, usually as simple fans (very rarely combining with colourless cells to form deeply-penetrating fans). Only infrequently exhibiting small vascular bundles unaccompanied by sclerenchyma. Very rarely exhibiting sclerenchyma additional to that associated with the vascular bundles.

Chromosome base number **usually $x = 7$** (rarely 2, 5, 9–10, 13, 19). Mean diploid 2c DNA value 2.3–17.7, group mean 8.9.

Rusts: *Puccinia* species. Smuts: species of *Entyloma*, *Tilletia*, *Urocystis*, *Ustilago* (only questionable records for *Sphacelotheca*, none for *Sorosporium*).

Triticodae

Leaves often auriculate. **Inflorescence usually a distichous spike or spikeate with clusters of spikelets, or a raceme, rarely a panicle.** Inflorescence axes persistent or (commonly) **disarticulating at the joints.** Spikelets often large (5–70 mm long). *Female-fertile spikelets* with the rachilla prolonged beyond the uppermost female-fertile floret, with distal incomplete florets. **Glumes often lateral to the rachis or displaced to the front of the spikelet,** sometimes joined, sometimes subulate. Female-fertile florets 1–30. Lemmas often awned (awns 1, rarely 3), the (median) awn **non-geniculate,** usually apical or from a sinus, **usually entered by several veins.** **Ovary apex hairy, lodicules often ciliate.** Caryopsis longitudinally grooved, with a ling-linear hilum. Endosperm hard, without lipid, **containing only simple starch grains.** Embryo sometimes without an epiblast.

Abaxial leaf blade epidermis. Crown cells often present. Stomata sometimes very large (up to 84 microns), the apparatus usually conspicuously sunken.

Often xerophytic

Mean diploid $2c$ DNA value 3.7–16.8 pg, group mean 10.63.

Triticeae: *Elytrigia*, *Hordeum*, *Secale*, *Thinopyrum*.

Culms 5–170 cm high; herbaceous; unbranched above. Culm internodes solid or hollow. Leaves often auriculate. Adaxial ligule an unfringed membrane. **Inflorescence a single spike, or a false spike with clusters of spikelets;** the axes disarticulating at the joints, or persistent. *Female-fertile spikelets* 7–23 mm long; compressed laterally to terete; disarticulating above the glumes, falling with them, or (in cultivated forms) not disarticulating; with the rachilla prolonged apically. Glumes two; **lateral to the rachis or displaced;** similar; 1–12 nerved. Spikelets with or without incomplete florets, these when present distal. Female-fertile florets 1–10. Lemmas awnless to awned, the awn when present from a sinus or apical, non-geniculate. Lemmas keeled or not; without a germination flap; 5(–11) nerved. Palea relatively long; 2-nerved. Lodicules 2; membranous; ciliate. Ovary hairy. Stigmas white. *Fruit, embryo.* Hilum long-linear. Endosperm hard, starch grains simple. Embryo large or (more often) small; with or without an epiblast; with neither scutellar tail nor mesocotyl internode, the embryonic leaf margins meeting. *Abaxial leaf blade epidermis.* Crown cells often present.

Basic chromosome number, $x = 7$. $2n = 14-84$.

Brachypodieae: *Brachypodium*. (See genus for description.)

Bromeae: *Bromus*. (See genus for description.)

Poodeae

Leaves rarely auriculate (exceptions in Poeae). **Inflorescence nearly always a panicle** (a spike in *Lolium*, *Hainardia*), **the axes persistent** (except *Hainardia*). Spikelets often small (1–25(–45) mm long). *Female-fertile spikelets* with or without the rachilla prolonged beyond the uppermost female-fertile floret, with or without incomplete florets, incomplete florets when present usually distal, occasionally proximal (*Anthoxanthum*, *Phalaris*). Female-fertile florets 1–22. Lemmas awnless, mucronate or awned; awns 1 or 3, the (median) awn from a sinus, apical or dorsal, geniculate or non-geniculate, **usually entered by only one vein.** Ovary apex occasionally hairy (e.g. *Festuca*), **usually glabrous; lodicules nearly always glabrous** (exceptions *Ammophila*, *Festuca*). Caryopsis longitudinally grooved or not, the hilum short or (less often) long-linear. Endosperm hard or liquid, with lipid or (less often) without, **usually containing compound starch grains.** Embryo nearly always with an epiblast.

Abaxial leaf blade epidermis. Crown cells absent. Stomata 21–54 microns long, mean 57 microns.

Helophytic, mesophytic or xerophytic.

Mean diploid $2c$ DNA value 2.3–17.7 pg, group mean 7.9.

Aveneae (including *Agrostideae*, *Phalarideae*): *Agrostis*, *Aira*, *Ammophila*, *Anthoxanthum*, *Arrhenatherum*, *Avena*, *Calamagrostis*, *Corynephorus*, *Deschampsia*, *Gastridium*, *Helictotrichon*, *Holcus*, *Koeleria*, *Lagurus*, *Lophochloa*, *Periballia*, *Phalaris*, *Polypogon*

Culms 2–200 cm high; herbaceous; unbranched above; with hollow internodes. Leaves non-auriculate, sheath margins free. Adaxial ligule an unfringed membrane. **Inflorescence nearly**

always a panicle, rarely a raceme; the axes persistent. Spikelets not secund. *Female-fertile spikelets* 0.8–45 mm long; compressed laterally; usually disarticulating above the glumes, occasionally falling with them or not disarticulating; with or without an apically prolonged rachilla. **Hairy callus commonly present.** Glumes 2; similar; sometimes carinate; 1–3 (–17) nerved; **the upper nearly always long relative to the adjacent lemmas.** Spikelets with or without incomplete florets, these when present proximal, distal or both distal and proximal. Proximal incomplete florets when present 1 or 2, paleate or epaleate, male or sterile. **Female-fertile florets 1–2(–7).** Female-fertile lemmas only infrequently carinate, awnless or 1-, 3- or 5-awned. The (median) awn from a sinus or dorsal, non-geniculate or more often geniculate. Lemmas without a germination flap; (1–)3–7(–9) nerved. Palea usually relatively long, occasionally reduced and very short; (1–)2(–several) nerved, rarely nerveless. Lodicules nearly always present, nearly always membranous and glabrous. Ovary usually glabrous, rarely hairy. *Fruit, embryo.* Hilum short or long-linear. Endosperm hard or liquid, usually with lipid. Starch grains usually compound.

Basic chromosome number, $x = 4-13$ (usually 7). $2n = 8-147$.

Meliceae: *Melica*, *Striblochaete*.

Leaves with **sheath margins joined.** Inflorescence a raceme or panicle. Female-fertile spikelets laterally compressed or terete, with distal incomplete florets; with an apically prolonged rachilla; disarticulating above the glumes. Hairy callus absent. Glumes non-carinate. Female-fertile florets 1–7. Lemmas not carinate. Lodicules joined or free, fleshy or membranous, glabrous or ciliate. Ovary glabrous. Endosperm hard.

Basic chromosome number, $x = 9$ or 10.

Poeae (including *Hainardieae*, *Monermeae*): *Briza*, *Catapodium*, *Colpodium*, *Cynosurus*, *Dactylis*, *Festuca*, *Hainardia*, *Lamarckia*, *Lolium*, *Parapholis*, *Poa*, *Puccinellia*, *Sphenopus*, *Vulpia*.

Culms 2–200 cm high; herbaceous; rarely branched above. Nodes glabrous, internodes nearly always hollow. Leaves sometimes auriculate, sheath margins occasionally joined. Adaxial ligule an unfringed membrane. Inflorescence occasionally a spike or a raceme, usually a panicle; the axes occasionally disarticulating, usually persistent; the spikelets sometimes secund, occasionally two-ranked and distichous. *Female-fertile spikelets* 1.5–26 mm long; nearly always compressed laterally, rarely terete or dorsiventrally compressed; usually disarticulating above the glumes, rarely falling with them; with the rachilla prolonged or not. Hairy callus very rarely present. Glumes usually two and similar, rarely only one.; **commonly short relative to the adjacent lemmas;** carinate or non-carinate. Lower glume (0–)1–3(–15) nerved; upper glume 1–7(8–15) nerved. Spikelets with or without incomplete florets, these when present distal. **Female-fertile florets 1–22.** Lemmas awnless or 1-awned from a sinus, apically or dorsally; the awn when present usually non-geniculate. Lemmas carinate or not, (1–)3–7(–15) nerved. Palea usually relatively long, occasionally reduced and very short; 2-nerved. Lodicules 2, membranous, free, nearly always glabrous. Ovary usually glabrous, sometimes hairy but without an apical appendage. *Fruit, embryo.* Hilum short or long-linear. Endosperm liquid or hard, with or without lipid. Starch grains usually compound.

Basic chromosome number, x usually = 7 (occasionally 2, 5–6, 9, 13, 19); $2n = 4-117$.

Bambusoideae

Mostly perennial, culms woody or herbaceous; **often but not always overtly 'bambusoid' in appearance.** Leaves rarely basally aggregated, sometimes auriculate and often with auricular setae. Leaf blades linear to elliptic (i.e. often relatively broad), **often pseudopetiolate, often with readily visible transverse veins, commonly disarticulating.** Abaxial ligules common. Inflorescence sometimes indeterminate (sometimes with 'pseudospikelets'), usually paniculate, the axes usually persistent, often spatheate. Glumes 1–several, usually similar, sometimes minute or lacking. Spikelets frequently with incomplete florets, these proximal, distal or both proximal and distal to the female-fertile florets. **Proximal incomplete florets when present usually more than one** (except *Olyra*). *Female-*

fertile florets 1–30. Lemmas usually entire, awned (with a single, apical non-geniculate awn) or awnless; hairy (the hairs not in tufts or horizontal rows); occasionally with hairy (the hairs not in tufts or horizontal rows); occasionally with a germination flap. Palea present, usually relatively long; nerves 1, 2 or several, keel-less, 1-keeled or 2-keeled. Lodicules usually present, **1–5(–10), often 3**; ciliate or glabrous, often heavily vascularized. Stamens variable in number, **often more than 3**. Ovary apex glabrous or hairy. Stigmas 1–4, **often 3**. Fruit sometimes with a free pericarp, this sometimes thick and hard or fleshy; longitudinally grooved or not. Hilum occasionally short, usually long-linear. **Embryo usually small; with an epiblast; usually with a scutellar tail and overlapping embryonic leaf margins.** Endosperm without lipid.

Abaxial leaf blade epidermis. Microhairs usually present; **panicoid-type.** Mid-intercostal long-cells rectangular or fusiform, with markedly sinuous walls. **Papillae often present, often overarching the stomata, usually several or many per long-cell.** Costal silica bodies often panicoid-type, oryzoid or saddle-shaped, **hardly ever pooid-type, elongated-smooth or rounded.** Stomatal guard-cells overlapping the interstomata, flush with or overlapped by them; the subsidiaries usually triangular or dome-shaped, but occasionally parallel-sided. *Transverse section of leaf blade, physiology.* C₃; XyMS+. Blade commonly adaxially flat. Mesophyll not traversed by colourless columns; **often with arm-cells and/or fusoids.** Midrib usually conspicuous; with one bundle, a conventional arc or (often) with complex vascularization. Bulliforms usually present, usually on simple fans, very rarely associated with colourless cells to form deeply-penetrating fans. All the vascular bundles accompanied by sclerenchyma. Hardly ever exhibiting sclerenchyma additional to that directly associated with the vascular bundles (other than in midribs).

Chromosome base number, $x = 10, 11, 12, 15$ or **19 (nearly always 10, 11 or 12).**

Hydrophytic to mesophytic, rarely xerophytic. Often shade plants.

Rusts: *Dasturella*, *Physopella*, *Stereostromum* and *Puccinia*. Smuts: *Entyloma*, *Tilletia*, *Sorosporium*, *Tolyposporium* and *Ustilago*.

Oryzodae

Mostly perennial, but a few annuals; 'grasses', or to varying degrees 'bambusoid' in appearance. Culms to 1000 cm high or scandent, woody or (mostly) herbaceous; branched or (commonly) unbranched above. Leaves only occasionally with auricular setae. Leaf blades linear to ovate; often not pseudopetiolate; sometimes disarticulating, but more often persistent. Inflorescence without pseudospikelets, determinate except sometimes in *Olyreae*; sometimes spatheate, more often espatheate; of various forms. *Female-fertile spikelets* sometimes with the rachilla prolonged, more often not so. Glumes usually two and relatively large, but sometimes minute and not infrequently absent. Often without incomplete florets; these when present proximal, distal (or both), proximal incomplete florets 1–several. *Female-fertile florets* 1–17. Palea present, usually relatively large; nerves 0, 1, 2 or several; with equal frequency 1- or 2-keeled, less often keel-less; **entire.** Lodicules usually present, **more often 2 than 3; rarely ciliate.** Ovary nearly always glabrous and unappendaged. **Stigmas usually 2.**

Abaxial leaf blade epidermis. Papillae present or absent with about equal frequency, sometimes present on the stomatal subsidiaries. Stomatal guard-cells more often flush-to-overlapping the interstomata than overlapped by them. Mesophyll sometimes with arm cells and/or fusoids, but **often without either.**

Chromosome base numbers mostly $x = 10, 11$ or **12; mostly diploid.** Mean diploid $2c$ DNA value 1.7–4.4 pg, group mean 3.05.

Rusts *Physopella*, *Puccinia*. Smuts *Entyloma*, *Tilletia*, *Sorosporium*, *Tolyposporium*, *Ustilago*.

Oryzae: *Leersia*, *Oryza*, *Prospachloa*.

Culms herbaceous. Leaf blades without readily visible transverse veins. Adaxial ligule an unfringed membrane; sometimes very long. Inflorescence paniculate; espatheate; the spikelet-bearing axes persistent. *Spikelets* all alike; laterally compressed; disarticulating above the glumes, or above the

vestiges representing them; without an apically prolonged rachilla. **Glumes absent, or reduced to a 2-lobed cupule.** Incomplete florets present or absent; when present proximal only, represented by a single sterile lemma exceeded by the female-fertile one. Female-fertile florets 1. Lemma carinate, without a germination flap. Palea relatively long, with several nerves. Ovary apex glabrous, unappendaged. Stigmas white. Hilum long-linear. Embryo small; with an epiblast; without a mesocotyl internode; embryonic leaf margins overlapping.

Abaxial leaf blade epidermis. Microhairs present; panicoid-type. Mid-intercostal long-cells rectangular, with markedly sinuous walls. Papillae present. Costal silica bodies 'oryzoid-type'. Stomata with triangular subsidiaries. Costal short-cells conspicuously in long rows. *Transverse section of leaf blade, physiology.* C₃; XyMS+. Mesophyll with or without arm-cells; with or without fusoids.

Chromosome base number, $x = 12$. $2n = 24–60$.

Olyreae: *Olyra*. (See genus for description.)

Centotheceae: *Megastachya*. (See genus for description.)

Ehrharteae: *Ehrharta*, *Microlaena*.

Culms 15–200cm high, woody and persistent or herbaceous. Leaf blades linear to linear-lanceolate; not pseudopetiolate; without readily visible transverse veins. Adaxial ligule a fringed or unfringed membrane, or a fringe of hairs. Inflorescence paniculate, or a single raceme; espatheate; with persistent axes. *Female-fertile spikelets* compressed laterally to terete; disarticulating above the glumes; with or without an apically prolonged rachilla (*Ehrharta* sometimes exhibiting a minute prolongation). Glumes minute (*Microlaena*) or relatively large. **Incomplete florets present; proximal only; 2; epaleate; sterile.** Female-fertile florets 1. Lemma decidedly firmer than the glumes; carinate; without a germination flap; 5–7 nerved. Palea present; variable in relative size; nerveless, with 1 nerve, or with several; (0–)1(–2) keeled. Stamens 2–6. Ovary glabrous. Stigmas 2. Caryopsis compressed laterally, not grooved. Hilum long-linear. Embryo small.

Abaxial leaf blade epidermis. Microhairs present or absent; when present panicoid-type. Costal silica-bodies 'panicoid-type'.

Transverse section of the leaf blade, physiology. C₃; XyMS-. Arm-cells occasionally present in *Ehrharta*.

Chromosome base number, $x = 10$ or **12.** $2n = 24$ or 48.

Bambusodae

Woody bamboos, with branching, robust culms. Leaves pseudopetiolate, commonly with auricular setae; the blades lanceolate to ovate, with or without readily visible transverse veins, **disarticulating from the sheaths.** Inflorescence indeterminate or determinate, with or without pseudospikelets; structure variable, but **usually spatheate**; axes persistent. *Female-fertile spikelets* usually large (group mean 30 mm long); usually disarticulating above the glumes and (when applicable) between the florets. Rachilla usually prolonged beyond the uppermost female-fertile floret. Glumes occasionally 1, usually 2 or (not infrequently) several; usually relatively large, but decidedly shorter than the adjacent lemmas; similar. Incomplete florets usually present; occasionally proximal only, more often distal or both proximal and distal. Proximal incomplete florets when present 1–several. Female-fertile florets 1–30. Palea present, relatively large; **usually with several nerves**; 2-keeled or keel-less; notched or entire. Lodicules usually present; occasionally 1 or 2, **usually 3 or more; usually ciliate.** Stamens usually more than 3. Anthers sometimes with an apically prolonged connective. Ovary glabrous or hairy; often with a conspicuous apical appendage; styles usually joined, at least below; stigmas 2 or (more often) **3 or more.**

Abaxial leaf blade epidermis. Papillae nearly always present and very conspicuous, usually over-arching the stomata; absent from the subsidiaries. Stomatal guard-cells often overlapped by the interstomata. *Transverse section of leaf blade.* Lamina often distinctly asymmetrical about the midrib. **Mesophyll nearly always with both arm-cells and fusoids.**

Chromosome base number, $x = 12$ (very rarely 11); rarely diploid, **usually tetra- or hexaploid.**

Rusts: *Dasturella*, *Stereostromum*, *Puccinia*. Smuts: *Tilletia*, *Ustilago* (very few recorded).

Bambuseae: *Bambusa*, *Oxytenanthera*, *Thamnocalamus*.

Arundinoideae

Mostly perennial herbs, often caespitose with mainly basal leaves, but occasionally more or less 'bamboooid' in habit. Culm internodes solid or hollow. Leaf blades mostly linear or linear-lanceolate, hardly ever pseudopetiolate, but not infrequently disarticulating; hardly ever exhibiting conspicuous transverse veins. Adaxial ligule present, sometimes an unfringed membrane but more often a fringed membrane or a fringe of hairs. Abaxial ligule sometimes present. Inflorescence determinate, without pseudospikelets; occasionally of very few spikelets; usually paniculate or reduced to a raceme, occasionally a spike or spicate; espatheate; the axes persistent. Spikelets not in distinct long- and short combinations. *Female-fertile spikelets* usually compressed laterally or terete, occasionally compressed dorsiventrally; nearly always disarticulating above the glumes and (when applicable) between the florets. Rachilla prolonged apically or not. Glumes 2, relatively large, very unequal or (more often) more or less equal, carinate or not, nearly always similar. Lower glume (1–3–7(–11) nerved; upper glume 1–7(–11) nerved. Incomplete florets present or absent, nearly always distal only, very occasionally both distal and proximal (e.g. *Phragmites*). Proximal incomplete florets when present 1 only. Female-fertile florets 1–10. Lemmas sometimes entire, but usually incised and often deeply cleft; sometimes mucicose or mucronate, usually awned. Awns 1 or 3, (the median) from a sinus or occasionally apical, geniculate or non-geniculate with a peculiar awn configuration characterizing Aristideae: (*q.v.*). Lemmas usually hairy, the hairs sometimes conspicuously arranged in tufts and/or transverse rows; occasionally carinate, more often rounded on the back; (1–3–9(–11) nerved. Palea present, nearly always 2 nerved and usually 2 keeled or keel-less; entire, notched or occasionally deeply cleft. Lodicules usually present, usually 2 (occasionally 3, usually 3 in Stipeae); fleshy or membranous; ciliate or glabrous. Stamens (1–)3. Ovary apex glabrous or hairy. Styles occasionally joined below, usually free. Stigmas nearly always 2; white, red-pigmented or brown. Fruit usually a caryopsis, but occasionally with a free pericarp, the latter sometimes thick and hard; longitudinally grooved or not. Hilum long-linear to short. Embryo large or small, sometimes waisted. Endosperm hard; without lipid; usually with compound starch grains (*Prionanthium* exceptional). Embryonic leaf margins usually meeting, the other embryo anatomical features variable.

Abaxial leaf blade epidermis. Microhairs present or absent (but usually present somewhere on the plant); panicoid-type or 'stipoid' (in Stipeae). Papillae nearly always absent. Costal silica-bodies of various forms, but hardly ever of the 'poid' (horizontally elongated-crenate or sinuous) type. Stomatal guard-cells usually overlapping to flush with the interstomata; subsidiaries triangular, dome-shaped or occasionally parallel-sided. *Transverse section of leaf blade, physiology.* C_4 or (more often) C_3 . $XyMS+$ or $XyMS-$. Where biochemically typed, consistently NADP-ME (i.e. even where $XyMS+$). The blade usually ribbed adaxially, the ribs rather frequently of different size orders. Mesophyll without arm-cells (except *Phragmites*); without fusoids; hardly ever traversed by colourless columns. Midrib conspicuous or (more often) not readily distinguishable from the other main veins; usually with one bundle only, rarely a simple arc of bundles. Bulliforms present or absent; when present usually simple fans, hardly ever associated with colourless cells to form deeply-penetrating fans. Smallest vascular bundles usually accompanied by sclerenchyma. Rather frequently exhibiting sclerenchyma additional to that directly associated with the vascular bundles (e.g. with a continuous abaxial hypodermal layer).

Chromosome base numbers very variable (6, 7, 9, 11, 12, 13 etc.).

Helophytic, mesophytic or xerophytic; in open habitats.

Rusts: *Daturella*, *Puccinia*. Smuts: *Neovossia*, *Tilletia*, *Urocystis*, *Sorosporium*, *Sphacelotheca*, *Tolyposporium*, *Ustilago*.

Stipeae: *Nassella*, *Stipa*.

Culms 10–250 cm high; nearly always herbaceous. Leaf blades narrow; not pseudopetiolate; without readily visible transverse veins. Adaxial ligule a fringed or unfringed membrane. Abaxial ligule sometimes present. Inflorescence determinate; paniculate; espatheate; the axes persistent. *Female-fertile spikelets* compressed laterally; disarticulating above the glumes;

without an apically prolonged rachilla; with a hairy callus. Glumes 2; more or less equal; about equalling or exceeding the spikelets. Lower glume 1–4 nerved; upper glume 3–6 nerved. **Without incomplete florets.** *Female-fertile florets* 1. Lemma often convolute; decidedly firmer than the glumes, becoming **indurated**; without a germination flap; conspicuously awned. The single awn apical, from a small sinus or dorsally from near the top; geniculate; **entered by several veins**. Palea well developed to very reduced; **keel-less**. Lodicules present; 2 or 3; membranous; glabrous. Stamens 3 (sometimes with penicillate anthers). Ovary glabrous. Stigmas 2 or 3–4. Caryopsis not grooved. Hilum long-linear. Embryo large or small.

Abaxial leaf blade epidermis. Microhairs absent (but a peculiar form occasionally seen abaxially). Costal silica-bodies variable (often 'panicoid-type', crescentic or rounded), but not 'poid-type'.

Transverse section of leaf blade, physiology. C_3 ; $XyMS+$. Mesophyll with neither arm-cells nor fusoids. All vascular bundles accompanied by sclerenchyma.

Chromosome base number, $x = 9-12$ or 22. $2n = 22-96$.

Arundineae: *Arundo*, *Phragmites*.

Reeds. Culms 80–600 cm high; woody and persistent or herbaceous; branched or unbranched above. Leaf blades 6–60 mm wide; lanceolate to linear-lanceolate; **not pseudopetiolate**; without readily visible transverse veins; **disarticulating from the sheaths**. Adaxial ligule a fringed membrane or a fringe of hairs. Abaxial ligule absent. **Inflorescence a large, plumose, open panicle**; the axes persistent. *Female-fertile spikelets* compressed laterally; disarticulating above the glumes and between the florets; with an apically prolonged rachilla. Glumes similar, both 3–5 nerved. Incomplete florets present or absent; if present distal or both distal and proximal. *Female-fertile florets* 2–10. Lemmas entire to incised but not deeply cleft; less firm than the glumes to resembling them in texture; awned (with a median, non-geniculate awn apically or from a sinus); hairless, or hairy but **lacking tufts and transverse rows of hairs**; rounded on the back. Palea 2-nerved. Lodicules 2; fleshy; ciliate or glabrous. Stamens 3. Ovary glabrous. Hilum short. Embryo large.

Abaxial leaf blade epidermis. Microhairs present (panicoid-type), or absent. Papillae absent. Costal short-cell arrangements and silica-body forms variable. *Transverse section of the leaf blade, physiology.* C_3 ; $XyMS+$. Mesophyll tightly packed; with (*Phragmites*) or without arm-cells; without fusoids.

Chromosome base number, $x = 12$. $2n = 36-112$.

Danthonieae: *Centropodia*, *Chaetobromus*, *Cortaderia*, *Dregeochloa*, *Elytrophorus*, *Karroochloa*, *Merxmüllera*, *Pentameris*, *Pentastichis*, *Prionanthium*, *Pseudopentameris*, *Schismus*, *Styppeiochloa*, *Tribolium*, *Urochloa*.

Culms 2–300 cm high (mostly less than 250 cm); herbaceous; usually caespitose; branching or unbranched above. Leaves usually basally aggregated. Leaf blades 0.3–15 mm wide; **usually linear**; without readily visible transverse veins; rarely disarticulating. **Adaxial ligule nearly always a fringe of hairs or less often a fringed membrane**, rarely an unfringed membrane. Abaxial ligule sometimes present. Inflorescence usually a panicle, occasionally a raceme, rarely a spike (*Tribolium*) or falsely spicate with spikelet clusters (*Elytrophorus*); axes ending in spikelets; nearly always persistent. *Female-fertile spikelets* 1–55 mm long; usually disarticulating above the glumes and between the florets; with an apically prolonged rachilla (except sometimes in *Pentastichis*). Glumes usually more or less equal; similar; markedly shorter than to much exceeding the spikelets. Incomplete florets usually present, distal (proximal incomplete florets absent). *Female-fertile florets* 2–10 (1 in *Poaegrostis*). Lemmas **usually incised and sometimes deeply cleft**, occasionally entire; awnless, mucronate or 1 (occasionally 3 or 5)–awned apically or (more often) from the sinus. The (median) awn often geniculate. Lemmas sometimes with conspicuous tufts and/or transverse rows of hairs; only infrequently carinate; without a germination flap. Palea usually well developed, usually apically notched but occasionally entire or deeply bifid; 2-nerved and 2-keeled, the keels sometimes winged. Lodicules 2; usually fleshy; ciliate or glabrous. Ovary apex usually glabrous (hairy in *Dregeochloa* and *Pentameris*). Hilum shape and embryo size variable.

Abaxial leaf blade epidermis very variable. Papillae absent.

Transverse section of the leaf blade, physiology. Nearly all C_3 (*Centropodia* C_4); $XyMS+$. Mesophyll without arm cells; without fusoids. Midrib usually inconspicuous, usually with one bundle only. Chromosome base numbers, $x = 6, 7, 9, 12, 13$.

Aristideae: *Aristida*, *Sartidia*, *Stipagrostis*.

Culms 15–200 cm high; herbaceous; caespitose. Leaf blades mostly not disarticulating; linear. Adaxial ligule a fringed membrane or a fringe of hairs. Inflorescence an espatheate panicle with persistent axes. *Female-fertile spikelets* laterally compressed or terete; disarticulating above the glumes; without incomplete florets; without an apically prolonged rachilla. **Female-fertile floret 1.** Lemma narrow, often convolute; with or without a germination flap; awned apically. The awn of **characteristic form, with a basal column and trifold above (or evidently a derivative of this).** Palea relatively short to very reduced; 0–2 nerved. Lodicules present or absent; membranous; glabrous. Embryo without an epiblast; with an elongated mesophyll internode; the embryonic leaf margins meeting.

Abaxial leaf blade epidermis. Microhairs present; panicoid type. Papillae absent. Costal silica bodies variable in form; costal short-cells variable in arrangement. *Transverse section of leaf blade, physiology.* C_4 (*Aristida*, *Stipagrostis*) or C_3 (*Sartidia*). XyMS+ or XyMS-. Mesophyll with neither arm-cells nor fusoids. Midrib conspicuous to inconspicuous, with one bundle only.

Chromosome base number, $x = 11$ or (occasionally) 12. $2n = 22-66$.

Chloridoideae

Culms 5–250(–300) cm high, nearly always herbaceous; branching above, or unbranched. Young shoots nearly always intravaginal. Leaves non-auriculate, without auricular setae. Blades nearly always linear or linear-lanceolate; not pseudopetiolate; without readily visible transverse veins; hardly ever disarticulating. **Adaxial ligule nearly always a fringed membrane or a fringe of hairs, very rarely an unfripped membrane** (*Bewisia*, *Diandrochloa*, *Lintonia*). Abaxial ligule very rarely present. Inflorescence determinate; commonly of spike-like main branches (sometimes digitate) or paniculate, but sometimes a raceme, a spike, or falsely spicate with clusters of spikelets; **espatheate; axes usually persistent, occasionally disarticulating.** Spikelets often secund (then often biseriate), or non-secund (occasionally distichous); hardly ever in distinct long-and-short combinations. *Female-fertile spikelets* usually compressed laterally or terete, but sometimes compressed dorsiventrally (*Craspedorhachis*, *Diplachne*, *Microchloa*, *Monelytrum* etc.); falling with the glumes or (more commonly) disarticulating above them; when applicable, disarticulating between the florets or (often) not so. Rachilla prolonged beyond the uppermost female-fertile floret or (less frequently) not. Glumes present; 2; relatively large; equal or unequal; sometimes awned; similar to very dissimilar. **Lower glume (0)–1(–several) nerved; upper glume 1–3(–5 or more) nerved.** With or without incomplete florets, these when present usually distal, occasionally both distal and proximal, **very rarely proximal only (then 1–several).** Female-fertile florets 1–20. Lemmas entire or incised and sometimes (then sometimes deeply cleft); mucous, mucronate or awned; hairy (the hairs not conspicuously in tufts and/or transverse rows) or hairless; carinate or not; **without a germination flap; nerves (1)–3(–11).** Awns when present 1–several (then the median similar in form to the laterals); (the median) **apical or from a sinus, non-geniculate.** Palea nearly always 2-nerved and 2-keeled, the keels often winged; entire or notched. Lodicules occasionally absent; when present 2, **fleshy, nearly always glabrous.** Stamens (1–3). Ovary apex glabrous. Styles occasionally joined at the base, usually free. Stigmas 2; white, red or brown. Fruit rarely longitudinally grooved; a caryopsis or (quite frequently) the pericarp free or loose. **Hilum short.** Endosperm hard, without lipid, usually but not always containing compound starch grains. **Embryo large; usually with an epiblast; scutellar tail and elongated mesocotyl internode present, embryonic leaf margins usually meeting.**

Abaxial leaf blade epidermis. Microhairs nearly always present; **occasionally panicoid-type** (e.g. *Eragrostis* and allies), sometimes ‘*Enneapogon* type’, usually **chloridoid-type.** Mid-intercostal long-cells rectangular, nearly always with markedly sinuous walls. Papillae present or absent. Costal silica bodies diverse, but mostly ‘panicoid-type’ or saddle-shaped (never ‘pooid-type’, hardly ever elongated-smooth). Stomatal guard-cells nearly always flush with to overlapping the interstomatal; subsidiary triangular or dome-shaped,

hardly ever parallel-sided. **Costal short-cells usually in long rows, but occasionally predominantly paired, solitary or in short rows.** *Transverse leaf blade section, physiology.* C_4 , with the sole known exception of *Eragrostis walteri*. XyMS+. Biochemical types PCK and NAD-ME. Mesophyll often traversed by colourless columns; rarely exhibiting arm-cells; without fusoids. Blade very frequently adaxially flat, ribs when present usually constant in size. Midrib conspicuous or not readily distinguishable; usually with a single bundle, occasionally with a simple arc; sometimes with colourless tissue. Bulliforms usually present; **commonly combined with colourless cells to form deeply-penetrating fans, or comprising simple fans each with a deeply-penetrating median cell.** Smallest bundles usually accompanied by sclerenchyma. Rarely exhibiting sclerenchyma other than that directly associated with the bundles.

Chromosome base number, $x = 10$ (infrequently 7, 8, 9, 12). Mean diploid $2c$ DNA value 0.7–1.4 pg, group mean 1.05.

Mostly mesophytic to xerophytic, occasionally helophytic. In open habitats; rather frequently maritime or halophytic.

Rusts: *Physopella*, *Puccinia*, Smuts: *Entyloma*, *Melanotaenium*, *Tilletia*, *Sporisorium*, *Sphacelotheca*, *Tolyposporella*, *Ustilago*.

Pappophoreae: *Enneapogon*, *Kaokochloa*, *Schmidtia*.

Culms 5–100 cm high; herbaceous. Nodes often hairy, internodes hollow. Leaf blades linear to linear-lanceolate. Adaxial ligule a fringe of hairs. **Inflorescence an open or contracted (sometimes very contracted) panicle; espatheate; the axes persistent.** *Female-fertile spikelets* disarticulating above the glumes but not between the florets; the rachilla hairy, prolonged apically. **Glumes about equalling the spikelets; similar; (5)–7–11(–21) nerved.** Incomplete florets present, distal only. Female-fertile florets 1–9. Lemmas firmer than the glumes; incised into 4, 6 or 9 lobes; hairy; not carinate; without a germination flap; **9 nerved; 2–3, 5 or 9 awned, the awns lateral only or median and lateral, all similar and non-geniculate.** Palea well developed, 2 nerved and 2 keeled. Lodicules fleshy or membranous, ciliate or glabrous. Ovary glabrous; stigmas white. Pericarp fused. Hilum short. Embryo large; with epiblast, scutellar tail and mesocotyl internode, the embryonic leaf margins overlapping.

Abaxial leaf blade epidermis. Microhairs present; *Enneapogon* type. Mid-intercostal long-cells rectangular. Papillae absent. Costal short-cells in long rows, the costal silica bodies panicoid-type. *Transverse section of the leaf blade, physiology.* C_4 ; XyMS+. Midrib of one bundle only. All the vascular bundles accompanied by sclerenchyma.

Chromosome base number, $x = 9, 10$.

Chlorideae (including *Cynodonteae*, *Eragrosteae*, *Sporoboleae*, *Aeluropodeae*, *Lappagineae*, *Lectureae*, *Trageae*, *Spartineae*): *Acachne*, *Bewisia*, *Brachyachne*, *Brachyachloa*, *Catalepis*, *Chloris*, *Cladoraphis*, *Coelachyrum*, *Craspedorhachis*, *Ctenium*, *Cynodon*, *Dactyloctenium*, *Diandrochloa*, *Dinebra*, *Diplachne*, *Eleusine*, *Enteropogon*, *Entoplocamia*, *Eragrostis*, *Eustachys*, *Fingerhuthia*, *Harpochloa*, *Leptocarydion*, *Leptochloa*, *Lepturus*, *Lintonia*, *Lophachne*, *Microchloa*, *Monelytrum*, *Mosdenia*, *Odyssea*, *Oropetium*, *Perotis*, *Pogonarthria*, *Polevansia*, *Rendlia*, *Schoenefeldia*, *Spartina*, *Sporobolus*, *Stiburus*, *Tetrachne*, *Tetrapogon*, *Tragus*, *Trichoneura*, *Tripogon*, *Triraphis*, *Willkommia*.

Culms (1)–10–250(–300) cm high; herbaceous; with glabrous nodes. Internodes solid or hollow. Leaf blades usually linear or linear-lanceolate. **Adaxial ligule usually a fringed membrane or a fringe of hairs, occasionally an unfripped membrane** (e.g. *Bewisia*, *Diandrochloa*). Inflorescence variously a single spike or a raceme, of spike-like main branches (sometimes digitate), falsely spicate with clusters of spikelets, or a panicle; espatheate. Inflorescence axes persistent, less often disarticulating (then disarticulating at the joints, or the reduced axes falling as clusters of spikelets). Spikelets secund (often biseriate), or non-secund; sessile, subsessile or pedicellate, but not in distinct long-and-short combinations. *Female-fertile spikelets* usually compressed laterally, (exceptions *Diplachne*, *Enteropogon*, *Lepturus*, *Microchloa*, *Monelytrum*); usually adaxial in forms with discernable orientation; usually disarticulating above the glumes (or between them), sometimes falling with them; with or without an apically prolonged rachilla. The rachilla disarticulating between the florets or (not uncommonly) persistent. Glumes equal or unequal; similar to dissimilar; sometimes carinate; sometimes awned. **Lower glume (0)–1(–3) nerved; upper glume 1–3(–12) nerved.** Incomplete florets sometimes absent; usually present, then usually distal only (both distal and proximal in *Ctenium*, *Entoplocamia*). Female-fertile florets 1–45. Lemmas

rarely firmer than the glumes (not becoming indurated); entire or variously incised; hairy or hairless, the hairs rarely in tufts but not in transverse rows; carinate or not; without a germination flap; 1–5(–11) nerved; awnless, mucronate or awned. Lemma awns 1, 3 or 5; non-geniculate. Palea usually relatively long; entire or notched; usually 2-nerved and 2-keeled, the keels sometimes winged. Lodicules usually present, fleshy, glabrous. Anthers often very short. Ovary glabrous; stigmas 2, white, red or brown. Pericarp sometimes free or loose. **Hilum short. Embryo usually large.**

Abaxial leaf blade epidermis. Microhairs nearly always present; sometimes **panicoid-type** (e.g. *Eragrostis*), usually **chloridoid-type**. Papillae often present. Mid-intercostal long-cells rectangular. Costal short-cells usually in long rows, the silica bodies saddle-shaped or panicoid-type. *Transverse section of leaf blade, physiology.* C_4 (except *Eragrostis walteri*); PCK or NAD-ME; XyMS+. Midrib conspicuous to inconspicuous, with one bundle or a simple arc. Usually with all the vascular bundles accompanied by sclerenchyma.

Chromosome base number, x = usually 10 (occasionally 9, rarely 7 or 12).

Panicoideae

Culms 10–400 cm high; **mostly herbaceous** but occasionally woody and persistent; more often branching above than unbranched. Culm internodes more often solid than hollow. Leaves generally not basally aggregated, usually non-auriculate; without auricular setae. Blades mostly linear to ovate-lanceolate, flat or rolled; occasionally pseudopetiolate; occasionally with conspicuous transverse veins; rarely disarticulating. Adaxial ligule an infringed membrane, a fringed membrane or a fringe of hairs (all states common). Abaxial ligule occasionally present. Inflorescence **determinate; commonly paniculate, but almost as often of spike-like main branches** (sometimes digitate), occasionally a spike, a raceme or falsely spicate with clusters of spikelets; spatheate or not; the axes persistent or disarticulating. Spikelets commonly in distinct long- and short combinations. *Female-fertile spikelets* most commonly **compressed dorsiventrally**, less often compressed laterally or terete; **nearly always falling with the glumes**, only occasionally disarticulating above them; **the rachilla not prolonged above the uppermost female-fertile floret**. Glumes usually 2, occasionally 1; usually relatively large; equal to very unequal; **frequently very dissimilar**; (the longer) **usually long relative to the adjacent lemma**. Lower glume nerveless–11 nerved; upper glume (0)–1–9(–13) nerved. **Incomplete florets nearly always present, proximal; 1.** Female-fertile florets **nearly always 1**, very occasionally 2. Lemma with or without a germination flap; usually non-carinate; nerveless–11 nerved. Palea nerveless or 2 nerved, keel-less or two-keeled, entire or notched. Lodicules usually present, 2; **fleshy; usually glabrous**. Stamens (1)–3. Ovary glabrous. Styles free or (often) joined at the base. Stigmas 2; **usually red-pigmented**, rarely white or brown. Fruit a caryopsis; rarely longitudinally grooved; usually dorsiventrally compressed. Hilum occasionally long-linear, **usually short**. Endosperm hard, without lipid; starch grains sometimes compound, but **usually simple. Embryo usually large; without an epiblast; scutellar tail and mesocotyl internode present; embryonic leaf margins overlapping.**

Abaxial leaf blade epidermis. Microhairs present; **panicoid-type**. Mid-intercostal long-cells usually rectangular, occasionally fusiform (occasionally without typical long-cells); the walls usually but not always markedly sinuous. Papillae sometimes present; in various configurations; occasionally present on the stomatal subsidiaries. **Costal silica bodies nearly always 'panicoid-type'** (exception: *Oxyrhachis*), occasionally sharp-pointed. Stomatal guard-cells **nearly always flush with to overlapping the interstomata**; subsidiaries usually triangular or dome-shaped, very rarely parallel-sided. Costal short-cells **nearly always in long rows**, occasionally in other configurations. *Transverse section of the leaf blade, physiology.* C_3 or C_4 , XyMS+ or XyMS-. C_4 types PCK, NAD-ME or NADP-ME. Blade commonly adaxially flat, the ribs when present of equal size. Midrib inconspicuous or (usually) conspicuous; sometimes with one bundle, usually with a simple arc; often with adaxial colourless tissue. Mesophyll rarely traversed by colourless columns; **without arm-cells; very rarely with fusoids**. Bulliforms present or absent; infrequently associated

with colourless cells to constitute deeply-penetrating fans. **Commonly with the smallest bundles unaccompanied by sclerenchyma.** Very rarely having sclerenchyma not directly associated with the bundles.

Chromosome base numbers x = mostly 5, 9 or 10. 2–18 ploid. Mean diploid $2c$ DNA value 1.6–5.2 pg, group mean 3.03.

Helophytic or mesophytic, less often hydrophytic or xerophytic.

Rusts: *Daturella*, *Phakospora*, *Physopella*, *Puccinia*, *Smuts*; *Entyloma*, *Melanotaenium*, *Tilletia*, *Sorosporium*, *Sphecelotheca*, *Tolyposporella*, *Tolyposporium*, *Ustilago*.

Panicoideae

Leaf blades linear to ovate-lanceolate; occasionally with conspicuous transverse veins. Adaxial ligule sometimes an unfringed membrane, but more often a fringed membrane or a fringe of hairs. Abaxial ligule occasionally present. Inflorescence usually **espatheate**; occasionally with its branches naked-tipped or terminating in bristles; the axes occasionally disarticulating (then nearly always falling entire, frequently in the form of condensed spikelet clusters), but **usually persistent**. Spikelets often secund and biseriate when borne on spicate inflorescence branches; sometimes associated with bristles (reduced inflorescence branches or branch tips); occasionally in long- and short combinations, but then the **members usually alike in form and sexuality**. *Female-fertile spikelets* usually compressed dorsiventrally, but not infrequently compressed laterally; occasionally disarticulating above the glumes, but usually disarticulating below them, occasionally shed in clusters. Glumes very unequal or less frequently more or less equal; similar or dissimilar in about equal frequency. *Female-fertile lemma* usually at least as firm as the upper glume, **frequently firmer and becoming hardened in the fruit; nearly always with a germination flap**; infrequently awned and usually entire (save in Arundinelleae); (0)–3–11 nerved. Palea present, **nearly always well developed and relatively long**; usually entire (except Arundinelleae, *Rhynchelytrum*); **usually 2-nerved**, often 2-keeled. Hilum occasionally long-linear.

Transverse section of the leaf blade. C_3 or C_4 (occasionally genuinely intermediate). XyMS+ or XyMS-. C_4 types PCK, NAD-ME and NADP-ME. Mesophyll of C_3 forms occasionally *Isachne*-type; occasionally traversed by colourless columns.

Basic chromosome number x = mostly 9, occasionally 10, 12 etc. Mean diploid $2c$ DNA value 1.6–2.7 pg, group mean 2.3.

Paniceae: *Acroceras*, *Alloteropsis*, *Anthephora*, *Axonopus*, *Brachiaria*, *Cenchrus*, *Digitaria*, *Echinochloa*, *Entolasia*, *Eriochloa*, *Leucophrys*, *Megaloprotachne*, *Melinis*, *Odontelytrum*, *Opismenus*, *Oryzidium*, *Panicum*, *Parathiera*, *Paspalidium*, *Paspalum*, *Pennisetum*, *Pseudechinolaena*, *Sacciolepis*, *Setaria*, *Stenotaphrum*, *Stereochlaena*, *Tarigidia*, *Tricholaena*, *Urochloa*.

Culms 10–300(–800) cm high; mostly herbaceous; commonly branching above. Internodes often solid. Leaves usually not basally aggregated. Leaf blades linear to lanceolate (rarely ovate), 1–30 mm wide; occasionally cordate (e.g. *Acroceras*), or even sagittate (*Cymbosetaria*); sometimes pseudopetiolate; rarely with readily visible transverse veins; occasionally disarticulating. Adaxial ligule sometimes an unfringed membrane, more often a fringed membrane or a fringe of hairs. Abaxial ligule occasionally present. Inflorescence commonly of spike-like main branches (sometimes digitate or subdigitate) or a panicle, occasionally falsely spicate with spikelet clusters, rarely a raceme; very rarely spatheate; the axes sometimes naked-tipped or terminating in a bristle. The spikelet-bearing inflorescence axes persistent or disarticulating (then falling entire as spikelet clusters). *Female-fertile spikelets* usually dorsiventrally compressed, but terete or compressed laterally in *Acroceras*, *Pseudechinolaena*, *Rhynchelytrum*, *Sacciolepis*, *Tricholaena*; when orientation discernable, more often abaxial than adaxial; **usually disarticulating below the glumes; the rachilla not prolonged apically**. Glumes occasionally 1, **usually 2 and unequal**; usually very dissimilar; hardly ever carinate. **1 incomplete floret present; proximal; paleate or epaleate; male or sterile; the lemma less firm than to as firm as the female-fertile one.** *Female-fertile floret* 1. Lemma nearly always entire (sometimes incised in *Melinis*, *Rhynchelytrum*); occasionally mucronate or with an apical, non-geniculate awn; usually hairless; **usually with a germination flap**; rarely carinate; mostly 3–7 nerved; **usually firmer than the glumes, often becoming indurated**. Palea relatively long; usually entire;

usually similar in texture to the lemma (often indurated); 2 nerved. Lodicules usually present; fleshy; glabrous. Ovary glabrous; styles sometimes joined at their bases; stigmas usually red (occasionally white or brown). *Fruit, embryo*. Fruit usually compressed dorsiventrally. **Hilum usually short** (long-linear in *Acroceras*). Embryo large.

Abaxial leaf blade epidermis. Microhairs present; nearly always panicoid-type. Mid-intercostal long-cells rectangular. Papillae occasionally present. Costal short-cells usually in long rows; costal silica-bodies usually panicoid-type. *Transverse section of leaf blade, physiology*. C_4 (including all three biochemical types), or C_3 ; $XyMS+$ or $XyMS-$. C_4 anatomical organization 'conventional', except in *Alloteropsis* (q.v.). Mesophyll without 'circular' ('distinctive') cells; without arm cells; without fusoids. Midrib usually more or less conspicuous, often with an arc of bundles. Commonly exhibiting small vascular bundles unaccompanied by sclerenchyma.

Chromosome base number, x = **usually 9** (occasionally 7, 10, 11, 12, 15 or 17).

Arundinelleae: *Arundinella*, *Danthoniopsis*, *Loudetia*, *Trichopteryx*, *Tristachya*.

Culms (2)–25–300(–500) cm high; herbaceous. Leaves rarely basally aggregated. Leaf blades linear to lanceolate; not cordate, not sagittate; without readily visible transverse veins; rarely pseudopetiolate. Adaxial ligule a fringed membrane or a fringe of hairs. **Inflorescence an open or contracted panicle** (rarely reduced to a raceme); non-digitate; **the axes persistent; espatheate**; terminated by spikelets. Spikelets solitary, paired or in triplets. **Female-fertile spikelets compressed laterally to terete**; 1.5–4.5 mm long; **disarticulating above the glumes** and between the florets; usually with a hairy callus and **without an apically prolonged rachilla**. Glumes usually very unequal; non-carinate; dissimilar to similar; **3 or 5 nerved**. Incomplete florets present; proximal only; 1; male or sterile. **Proximal lemma less firm than the female-fertile one, or similar in texture**. *Female-fertile* floret 1. Lemma not becoming indurated; **usually 2-toothed or lobed**, sometimes deeply cleft; usually awned, the awns 1 (median) or 3 (median and lateral), the (median) awn from the sinus, geniculate; non-carinate; with or without a germination flap; hairy (the hairs sometimes in tufts, occasionally in transverse rows) or hairless; (1)–5–7(–9) nerved. Palea usually notched; not indurated; 2 nerved; 2 keeled. Lodicules 2; fleshy; glabrous. Ovary usually glabrous (hairy in *Tristachya*); stigmas free to their bases. *Fruit, embryo*. Caryopsis often **longitudinally grooved**. Hilum **usually long-linear**. Embryo large.

Abaxial leaf blade epidermis. Microhairs present; panicoid-type. Mid-intercosta; long-cells usually rectangular. Papillae absent. Costal short-cells usually in long rows, the costal silica-bodies usually panicoid-type (sometimes round or crescentic in *Arundinella*). *Transverse section of the leaf blade, physiology*. C_4 ; $XyMS-$ (except sometimes in *Loudetiopsis*). Mesophyll often with 'colourless' ('circular'), 'distinctive' cells; without arm-cells; without fusoids. Midrib conspicuous to inconspicuous; with one bundle, or an arc. Often with small vascular bundles unaccompanied by sclerenchyma.

Chromosome base number, x = **10 or 12** (less often 6–7, 9 or 14).

Andropogonodae

Leaf blades linear to lanceolate; very rarely disarticulating. Adaxial ligule rather more often an unfringed membrane than a fringed membrane or a fringe of hairs. Abaxial ligules absent. Inflorescence diverse, but not exhibiting naked branch-tips or reduced-branch bristles; often comprising spicate 'racemes', which may be variously (sometimes greatly) reduced; **frequently spatheate and comprising 'partial inflorescences'** (i.e. with the limits of the 'inflorescence' only arbitrarily definable); **the axes usually disarticulating**. Spikelets **usually paired (or in triplets)**; **usually in long-and-short combinations**; frequently heterogamous, the members of a combination predictably different in sexuality (the short-pedicelled or sessile members usually female or hermaphrodite, the longer-pedicelled members male or sterile). *Female-fertile spikelets* usually falling in combination with the adjoining member and their rachis segment; usually dorsiventrally compressed. Glumes 2, usually more or less equal; **usually very dissimilar**. The single **proximal lemma nearly always larger and more substantial than the female-fertile one**, which is frequently reduced and hyaline, sometimes comprising a mere stipe. Female-fertile lemma often (minutely) bifid, **often with a geniculate awn from**

the apex or the sinus; sometimes virtually reduced to the awn; **without a germination flap**; not forming a hardened protection for the fruit; rarely more than 3-nerved, often nerveless or 1-nerved. Palea **commonly absent or vestigial, relatively short** or well developed; 2-nerved or (more often) nerveless; entire or notched.

Transverse section of leaf blade, physiology. Seemingly **exclusively C_4 , $XyMS-$ and NADP-ME type**. Midrib usually conspicuous; usually with an arc of bundles, usually with adaxial colourless tissue. Blade sometimes ribbed adaxially, but more often adaxially flat. Bulliforms and associated colourless cells sometimes forming arches over the smaller vascular bundles (and the adaxial epidermis sometimes extensively 'bulliform'). Usually with the smallest vascular bundles unaccompanied by sclerenchyma.

Chromosome base number, x = **mostly 5 or 10**, occasionally 9, 12 etc.

Mostly helophytic or mesophytic.

Andropogoneae

Culms 10–1200 cm high; mainly herbaceous. Leaf blades occasionally pseudopetiolate; without conspicuous transverse veins. Adaxial ligule a fringed or unfringed membrane, less commonly a fringe of hairs. **Plants usually bisexual, with bisexual spikelets, and possessing hermaphrodite florets**; (*Hypogynium* monoecious with all the fertile spikelets unisexual), occasionally with no hermaphrodite florets in *Heteropogon* also. The spikelets usually in long-pedicel/short-pedicel (or pedicellate/sessile) pairs or triplets, the members of each pair or triplet commonly differing in sexuality (heterogamous); the sessile or short-pedicelled members then usually female or hermaphrodite and the pedicelled or longer-pedicelled members usually male-only or sterile (but the situation reversed in *Trachypogon*); or the spikelets all alike (homogamous: *Cleistachne*, *Eulalia*, *Imperata*, *Oxyrhachis*, *Saccharum* etc.). Inflorescence of spike-like main branches ('racemes') or paniculate (the panicles then often readily interpretable as made up of 'partial inflorescences' with reduced andropogonoid 'racemes'); **commonly spatheate**. **The spikelet-bearing axes usually disarticulating at the joints, the fruiting spikelet then falling with the adjoining rachis internode and non-fruiting spikelet(s)**; but occasionally the axes persistent, and the spikelets disarticulating individually beneath the glumes (*Cleistachne*, *Imperata*, *Sorghum* spp., *Trachypogon*). *Female-fertile spikelets* usually compressed dorsiventrally, sometimes laterally (e.g. *Arthraxon*, *Chrysopogon*, *Vetiveria*); without an apically prolonged rachilla; with a proximal incomplete floret (this occasionally missing in *Eulalia*), and with one female-fertile (hermaphrodite or female) floret above it. Glumes often very dissimilar. The proximal floret paleate or more often epaleate, usually sterile but sometimes male; its lemma usually larger and more substantial than the (commonly reduced) female-fertile lemma. **Female-fertile lemma usually more or less reduced (often to a stipe)**; entire or incised (commonly minutely so); mucicous, mucronate or awned (the single awn from the sinus or apical; geniculate); without a germination flap; often nerveless or 1 nerved, rarely with more than 3 nerves. Palea sometimes relatively long, but more often more or less reduced, vestigial or absent; 2 nerved or (more often) nerveless. Lodicules **usually present**; fleshy; occasionally ciliate. Ovary glabrous; stigmas usually red. *Fruit, embryo*. Hilum short. Embryo large.

Leaf blade epidermis. Microhairs nearly always present; panicoid-type. Papillae often present. Costal short-cells usually in long rows; costal silica-bodies usually panicoid-type. *Transverse section of the leaf blade, physiology*. C_4 ; type NADP-ME; $XyMS-$. Mesophyll without arm-cells; without fusoids; without 'circular' cells.

Chromosome base number, x = mainly 5 or 10, less often 9 (rarely 7, 11, 12, 15, 17 or 20).

(i) Andropogoninae ('awned Andropogoneae'): *Andropogon*, *Arthraxon*, *Bothriochloa*, *Chrysopogon*, *Cleistachne*, *Cymbopogon*, *Dichanthium*, *Diheteropogon*, *Elymandra*, *Eriochrysis*, *Eulalia*, *Heteropogon*, *Hyparrhenia*, *Hyperthelia*, *Imperata*, *Ischaemum*, *Microstegium*, *Miscanthus*, *Monocymbium*, *Schizachyrium*, *Selima*, *Sorghastrum*, *Sorghum*, *Thelepogon*, *Themeda*, *Trachypogon*, *Vetiveria*.

Spikelet-bearing axes usually 'racemes' (only rarely 'spike-like'), these sometimes much reduced; usually with slender rachides; elaiosomes usually absent; 'articles' usually hairy. Leaf blade abaxial epidermis often papillate. Adaxial surface of the leaf blade usually adaxially flat. Female-fertile lemma awned (except *Hypogynium* and a few species in other genera); commonly incised.

(ii) Rottboelliinae: *Coelorhachis*, *Elionurus*, *Hackelochloa*, *Hemarthria*, *Oxyrhachis*, *Phacelurus*, *Rhytachne*, *Rottboellia*, *Urelytrum*, *Vossia*.

Spikelet bearing axes 'spikes' with substantial rachides; elaiosome usually present; 'articles' usually glabrous. Pedicel of the pedicellate spikelet sometimes more or less fused to the rachis. Female-fertile lemma awnless; entire. Papillae very rare in the abaxial epidermis of the leaf blade. Leaf blade usually adaxially ribbed or 'nodular' in section.

Maydeae: *Coix*.

Culms herbaceous, robust. Leaf blades 30–70 mm wide. Plants monoecious, with all the fertile spikelets unisexual; without hermaphrodite florets. The male- and female-fertile spikelets in different inflorescences, on different branches of

the same inflorescence, or in different parts of the same inflorescence branch. Female spikelet with a paleate or epaleate, sterile proximal incomplete floret; with a single fertile lemma; without an apically prolonged rachilla. Female-fertile lemma awnless or mucronate; nerveless, 3 nerved or 4–5 nerved. Lodicules absent. Fruit, embryo. Hilum short. Embryo large. Epiblast absent; scutellar tail and mesocotyl internode present; embryonic leaf margins overlapping.

Abaxial leaf blade epidermis. Microhairs present; panicoid type or 'balanoform'. Papillae absent. Costal silica-bodies panicoid-type. Transverse section of the leaf blade, physiology. C₄; type NADP-ME; XyMS-. Mesophyll without arm-cells or fusoids.

Chromosome base number, $x = 5$ or 9–10; $2n = 10$ –108.

APPENDIX 2: DELTA

World grass genera – character list

The characters and their states recorded for each taxon are the heart of the DELTA system. In DELTA, several character types are used: unordered multistate characters, ordered multistate characters, real numbers, integer numbers and text characters. A character list is never complete but is constantly being augmented, changed and refined as research progresses. The full data for each genus in Watson's database of world grass genera is recorded using the following character list, which demonstrates the wide range of data from a number of disciplines that can be used for taxonomic comparisons. The figure numbers in this character list refer to the illustrations in Watson & Dallwitz (1988), and the literature references are given in full as part of the automated data set.

- #1. <Synonyms: i.e. 'genera' included in the current description — for most nomenclatural literature references, see Clayton and Renvoize 1986>/
- #2. <=*Sensu lato* genus: i.e. genus in which this taxon might reasonably be (or sometimes is) included>/

Habit, vegetative morphology.

- #3. <Longevity of plants>/
1. annual <or biennial, without remains of old sheaths or culms>/
 2. perennial <with remains of old sheaths and/or culms> <Figs 1, 2, 18>/
- #4. <Reeds>/
1. reeds <helophytic, tall, to (2–)3 m or more in height; culms woody and persistent, always leafy>/
 2. not reeds <implicit>/
- #5. <Habit>/
1. long-rhizomatous/
 2. long-stoloniferous/
 3. caespitose <Figs 1, 7>/
 4. decumbent <including 'rooting at the nodes'> <Fig. 2>/
- #6. The flowering culms <whether having foliage leaves> <intended mainly for bamboos>/
1. leafless/
 2. leafy/
- #7. <Mature> culms <maximum height: data unreliable for large genera>/
- cm high/
- #8. Culms <whether woody or herbaceous>/
1. woody and persistent/
 2. herbaceous <not woody, not persistent>/
- #9. Culms reaching <maximum diameter: note cm units, intended for bamboos>/
- cm in diameter/
- #10. Culms <shape: intended for bamboos>/
1. cylindrical/
 2. flattened on one side/
- #11. Culms <whether scandent>/
1. scandent/
 2. not scandent <self-supporting, scrambling or floating> <implicit>/
- #12. Culms <whether branched above>/
1. branched <vegetatively> above <Fig. 2>/
 2. unbranched <vegetatively> above <Figs 1, 7>/
- #13. <Number of> primary branches per mid-culm node <intended mainly for bamboos>/
- #14. Culms <whether tuberos at base>/
1. tuberos <at base> <Fig. 3>/
 2. not tuberos <at base — implicit>/
- #15. <Culm> nodes <whether hairy or glabrous>/
1. hairy <Figs 4, 33>/
 2. glabrous <Fig. 4>/
- #16. <Culm> nodes <number of ridges: bamboos>/
- ridged/
- #17. Culm sheaths <persistence (intended mainly for bamboos)>/
1. <or at least their bases> persistent/
 2. deciduous in their entirety/
- #18. <Mid> culm internodes <whether solid or hollow: avoid the 'peduncle'>/
1. solid <or spongy>/
 2. <conspicuously> hollow/
- #19. <Bambusoid habit, unicaespitose or pluricaespitose (intended for bamboos)>/
1. unicaespitose/
 2. pluricaespitose/
- #20. Rhizomes <form (intended mainly for bamboos)>/
1. pachymorph <sympodial>/
 2. leptomorph <monopodial>/
- #21. Plants <whether conspicuously armed>/
1. conspicuously armed <specify how>/
 2. unarmed/
- #22. Young <vegetative> shoots <whether extra- or intravaginal: poorly recorded>/
1. extravaginal <bursting through the bases of subtending sheaths> <Fig. 6>/
 2. intravaginal <emerging from between subtending sheath and stem> <Fig. 5>/
- #23. The <fresh> shoots <whether aromatic>/
1. aromatic <when crushed>/
 2. not aromatic <when crushed — implicit>/
- #24. Leaves <whether mainly basal, or mainly on the culms>/
1. mostly basal <Figs 7, 14>/
 2. not <distinctly> basally aggregated <i.e., the culms leafy> <Figs 1, 2, 9, 16, 33>/
- #25. Leaves <whether differentiated into sheath and blade>/
1. clearly differentiated into sheath and blade <implicit>/
 2. not clearly differentiated into sheath and blade/
- #26. Leaves <phyllotaxy>/
1. spirally disposed <Figs 8, 9>/
 2. distichous <the near-universal condition — implicit>/
- #27. Leaves <whether auricles present or absent: see Clifford and Watson 1977, for definition>/
1. auriculate <Fig. 10>/
 2. without auricles <Figs 12, 19 etc.>/
- #28. Leaves <presence of auricular setae (data poor, except for bamboos)>/
1. with auricular <'oral'> setae <Fig. 11>/
 2. without auricular <'oral'> setae <Fig. 12 etc.>/
- #29. <Leaf> sheath margins <whether joined>/
1. joined <to at least one-quarter of their length: 'sheaths tubular'>/
 2. free <implicit>/
- #30. <Comments on sheaths>/
- #31. Leaf blades <extreme reduction>/
1. <all> greatly reduced <with main functions transferred elsewhere>/
 2. not all greatly reduced <implicit>/
- #32. Leaf blades <shape: data incomplete>/
1. linear/
 2. linear-lanceolate/
 3. lanceolate/
 4. ovate-lanceolate/
 5. ovate/
 6. elliptic <oblong>/
 7. obovate/
- #33. Leaf blades <texture>/
1. leathery/
 2. flimsy/
 3. neither leathery nor flimsy <to become implicit>/
- #34. Leaf blades <whether broad or narrow (specify the true range)>/
1. broad <maximum (flattened) width greater than 1 cm>/
 2. narrow <maximum (flattened) width less than 1 cm>/
- #35. Leaf blades <mid-width: data very incomplete>/
- mm wide <in the middle>/

- #36. Leaf blades <whether cordate or sagittate>/
 1. <at least some of them> cordate <Fig. 13>/
 2. <at least some of them> sagittate/
 3. not cordate, not sagittate <implicit>/
- #37. Leaf blades <whether setaceous>/
 1. setaceous <i.e., fine and bristle-like: not to be confused with pungent, subulate etc.> <Fig. 14>/
 2. not setaceous <implicit>/
- #38. Leaf blades <folded/rolled>/
 1. flat/
 2. folded <Fig. 42>/
 3. rolled/
 4. acicular/
- #39. Leaf blades <whether needle-like>/
 1. hard, woody, needle-like <and plants prickly, e.g. *Triodia*> <Fig. 15>/
 2. not needle-like <plants not prickly> <implicit>/
- #40. Leaf blades <whether pseudopetiolate>/
 1. pseudopetiolate <Figs 11, 42>/
 2. not pseudopetiolate <implicit>/
- #41. Leaf venation <layout>/
 1. pinnate <Fig. 16>/
 2. palmate/
 3. neither pinnate nor palmate <implicit>/
- #42. Leaf blades <whether with conspicuous transverse veins>/
 1. with readily visible transverse veins <at least abaxially> <Fig. 17>/
 2. without readily visible transverse veins/
- #43. Leaf blades <whether disarticulating>/
 1. <or at least many of them, ultimately> disarticulating from the sheaths <Fig. 9>/
 2. not disarticulating/
- #44. Leaf blades <whether vernation rolled or folded>/
 1. rolled in bud/
 2. once-folded in bud/
 3. folded like a fan in bud/
 4. a rim of minute papillae/
- #45. <Adaxial> ligule <presence>/
 1. <consistently> present <implicit>/
 2. absent, at least from upper leaves/
- #46. <Adaxial> ligule <form — avoid seedlings>/
 1. an unfringed membrane <may be variously hairy or ciliate> <Fig. 19>/
 2. a fringed membrane <Figs 20, 21, 23>/
 3. a fringe of hairs <Fig. 22>/
 4. a rim of minute papillae/
- #47. <Adaxial> ligule <shape of apex>/
 1. truncate/
 2. not truncate <acute, obtuse or rounded> <Fig. 19>/
- #48. <Adaxial> ligule <length at middle: generally recorded only for membranous, unfringed forms>/
 mm long/
- #49. <Outer> contra-ligule <presence: data very incomplete>/
 1. present <Figs 11, 24>/
 2. absent <Fig. 12 etc.>/

Reproductive organization.

- #50. Plants <whether plants monoecious, with bisexual spikelets, or dioecious>/
 1. <bisexual, but> monoecious with all the fertile spikelets unisexual/
 2. bisexual, with <at least some> bisexual spikelets <Plates 1:4, 1:5, 1:8, 2:10, 2:11, 2:13–2:17 etc.>/
 3. dioecious <with separate male and female-fertile individuals> <Figs 25, 26>/
- #51. Plants <whether having hermaphrodite florets: not to be confused with presence or absence of hermaphrodite spikelets>/
 1. with <at least some> hermaphrodite florets <Plate 2:14 etc.>/
 2. without hermaphrodite florets/
- #52. The spikelets <whether heterospiculate: exclusive of 'hidden' spikelets>/
 1. of <at least two> sexually distinct forms on the same plant <e.g., female or hermaphrodite and sterile or male-only. Vestigial spikelets represented only by their pedicels have here been regarded as spikelets> <Plates 1:3, 1:6; Figs 27–29, 33, 75, 76>/
 2. all alike in sexuality <on the same plant: ignore hidden axillary spikelets, etc. Implicit>/
- #53. The male and female-fertile spikelets <disposition on the plant>/
 1. in different inflorescences/
 2. on different <main> branches of the same inflorescence/

3. segregated, in different parts of the same inflorescence branch <Plate 1:6>/
 4. mixed in the inflorescence/
- #54. The spikelets <whether heteromorphic (intended mainly for heterospiculate andropogonoids)>/
 1. overtly heteromorphic <Plate 1:6; Figs 27, 28, 75, 76>/
 2. <externally> homomorphic/
- #55. The spikelets <whether the spikelet combinations are all heterogamous: generally applied only to andropogonoids>/
 1. in both homogamous and heterogamous combinations,
 2. all in heterogamous combinations/
- #56. Plants <whether outbreeding or inbreeding — data extensively from Connor 1979>/
 1. outbreeding <alogamous>/
 2. inbreeding <autogamous>/
- #57. <Cleistogamy — data mainly from Connor 1979: exposed spikelets>/
 1. exposed-cleistogamous <associated with varying degrees of spikelet and/or floret modification>/
 2. chasmogamous <unreliably implicit>/
- #58. Plants <possession of hidden, cleistogamous spikelets in leaf axils or on specialised rhizomes>/
 1. with hidden cleistogenes <more or less hidden, usually conspicuously modified cleistogamous spikelets>/
 2. without hidden cleistogenes <implicit>/
- #59. The hidden cleistogenes <location>/
 1. in the leaf sheaths/
 2. subterranean <rhizanthogenes>/
- #60. <Whether apomixis observed: data mainly from Connor 1979>/
 1. apomictic/
 2. reproducing sexually <unreliably implicit>/
- #61. <Occurrence of vivipary (poorly recorded)>/
 1. viviparous/
 2. not viviparous <unreliably implicit>/

Inflorescence.

- #62. Inflorescence <whether determinate (semelauctant) or indeterminate (iterauctant or with a seemingly indeterminate synflorescence): see McClure 1973, Calderon and Soderstrom 1973 etc. for definitions>/
 1. determinate <semelauctant — implicit>/
 2. indeterminate <iterauctant> <Fig. 41>/
- #63. Inflorescence <whether possessing pseudospikelets: see McClure 1973 for definition>/
 1. with pseudospikelets <having basal bracts with axillary spikelets, in addition to or instead of the usual barren glumes> <Fig. 41>/
 2. without pseudospikelets <implicit>/
- #64. Inflorescence <reduction>/
 1. reduced to a single spikelet/
 2. of only two or three spikelets/
 3. normally of more than three spikelets <implicit>/
- #65. Inflorescence <chasmogamous: overall form>/
 1. a single spike <Plate 1:9; Fig. 30>/
 2. of spike-like main branches <of spikes, narrow racemes or narrow panicles> <Plate 1:4; Figs 31, 38, 53, 54>/
 3. a false spike, with clusters of spikelets on reduced axes <Plate 1:5; Figs 42, 49, 50, 51, 77>/
 4. a single raceme <at least some of the spikelets clearly pedicellate> <Fig. 33, 79>/
 5. paniculate <and not readily referable to any of the other states> <Plates 1:1, 1:3, 1:8, 2:12; Figs 34, 35, 36, 37, 55>/
- #66. Inflorescence <tumbleweeds>/
 1. deciduous in its entirety as a 'tumbleweed' <Fig. 26>/
 2. not deciduous <implicit>/
- #67. Inflorescence <overall form: mainly applied to panicles>/
 1. open <Plates 1:8, 2:12; Figs 34, 35>/
 2. contracted <very compact, or narrow and spike-like> <Plates 1:1, 1:3; Figs 36, 37>/
- #68. Inflorescence <compact, solitary: form — mainly applied to panicles and solitary racemes>/
 1. capitate <more or less spherical> <Plate 1:3>/
 2. more or less ovoid/
 3. elongated-symmetrical, spike-like <Fig. 37>/
 4. more or less irregular <neither capitate nor ovoid, not elongated-symmetrical>/
- #69. Inflorescence <whether branches divaricate>/
 1. with conspicuously divaricate branchlets <Fig. 40>/

2. without conspicuously divaricate branchlets <implicit>/
- #70. Inflorescence <whether branchlets capillary: avoid INTKEY use with non-paniculate inflorescences, which have usually been scored as 'inapplicable'>/
 1. with capillary branchlets <Fig. 35>/
 2. without capillary branchlets <implicit>/
- #71. Inflorescence <whether digitate or subdigitate>/
 1. digitate <includes paired branches> <Figs 38, 54>/
 2. subdigitate/
 3. non-digitate <neither digitate nor 'subdigitate' — implicit>/
- #72. With <number of primary inflorescence branches: applied mainly to forms with spike-like main branches — data very incomplete>/
 - primary inflorescence branches/
- #73. Inflorescence <whether branches end in spikelets>/
 1. with axes ending in spikelets <Figs 30, 32, 54>/
 2. axes <often> not ending in spikelets <Figs 26, 31, 49>/
- #74. Rachides <whether clearly (macroscopically) flattened, hollowed or winged (states poorly defined, often left uncoded)>/
 1. hollowed <Plates 1:7, 1:9; Figs 30, 56>/
 2. flattened <Fig. 39>/
 3. winged/
 4. neither flattened nor hollowed, not winged/
- #75. Spikelets <whether embedded in the rachis>/
 1. all <more or less> partially embedded in the rachis <Plates 1:7, 1:9; Figs 30, 42, 56>/
 2. not all embedded <implicit>/
- #76. Inflorescence <whether spatheate (note: 'spatheate' not currently distinguished from 'spatheolate')>/
 1. spatheate <specify> <ignore mere early enclosure by an unmodified flag leaf> <Figs 25, 26, 27, 43>/
 2. espatheate/
- #77. Inflorescence <whether comprising a complex of 'partial inflorescences' and intervening foliar organs (= leaves, spathes, spatheoles)>/
 1. a complex of 'partial inflorescences' and intervening foliar organs i.e., a 'pseudo-inflorescence' <Fig. 43>/
 2. not comprising 'partial inflorescences' and foliar organs/
- #78. <Ultimate> spikelet-bearing axes <form> <intended mainly for andropogonoids and bamboos>/
 1. very much reduced <specify> <Plate 1:5; Figs 26, 42, 49, 50, 51>/
 2. spikes/
 3. 'racemes' <Plate 1:6; Fig. 43>/
 4. spike-like <cf. *Hemarthria*> <Plate 1:7; Figs 27, 46, 47, 59, 60, 75, 76>/
 5. paniculate/
 6. capitate <= 1&5>/
- #79. The spikelet-bearing axes <andropogonoid, number of spikelet-bearing 'articles' (joints)>/
 1. with only one spikelet-bearing 'article'/'
 2. with 2–3 spikelet-bearing 'articles'/'
 3. with 4–5 spikelet-bearing 'articles'/'
 4. with 6–10 spikelet-bearing 'articles'/'
 5. with more than 10 spikelet-bearing 'articles' <specify the approximate number>/
- #80. The racemes <whether spikelet bearing to the base>/
 1. spikelet bearing to the base/
 2. without spikelets towards the base/
- #81. <Ultimate> spikelet-bearing axes <grouping> <intended mainly for andropogonoids>/
 1. solitary/
 2. paired/
 3. clustered <in groups of three or more>/
- #82. <Ultimate> spikelet-bearing axes <thickness of rachides> <intended mainly for andropogonoids>/
 1. with very slender rachides <Plate 1:6>/
 2. with substantial rachides <Plate 1:7; Fig. 27>/
- #83. Spikelet-bearing axes <whether disarticulating. Note that spikelet-bearing axes may be greatly reduced>/
 1. disarticulating <often manifested in clearly articulated rachides. Excluding inflorescences falling whole (tumbleweeds)> <Figs 26, 27, 44, 45, 46, 47, 59, 76>/
 2. persistent <not disarticulating: implicit> <Figs 30, 38, 39, 53>/
- #84. Spikelet-bearing axes <manner of disarticulation>/
 1. falling entire <Figs. 50, 51>/
 2. disarticulating at the joints <Figs 27, 44, 45, 46, 47, 59, 75, 76>/
- #85. The pedicels and internodes of the rachis <*Bothriochloa*, *Dichanthium* and relatives>/
 1. with a longitudinal, translucent furrow/
 2. without a longitudinal, translucent furrow <implicit>/
- #86. 'Articles' <('joints') of the spikelet-bearing rachis, shape (intended mainly for andropogonoids)>/
 1. linear/
 2. non-linear <Figs 44, 46, 47, 59, 75>/
- #87. 'Articles' <of the spikelet-bearing rachis: whether bearing an elaiosome>/
 1. with a basal callus-knob <elaiosome> <Fig. 47>/
 2. without a basal callus-knob/
- #88. 'Articles' <of the spikelet-bearing rachis, whether appendaged (intended mainly for andropogonoids)>/
 1. appendaged <Figs 45, 48>/
 2. not appendaged <Plate 1:7; Fig. 46>/
- #89. 'Articles' <of the spikelet-bearing rachis, orientation of disarticulation (intended mainly for andropogonoids)>/
 1. disarticulating transversely <Plate 1:7; Figs 44, 46, 47, 59, 75>/
 2. disarticulating obliquely <Figs 27, 28>/
- #90. 'Articles' <of the spikelet-bearing rachis, whether hairy (intended mainly for andropogonoids)>/
 1. densely long-hairy/
 2. somewhat hairy/
 3. glabrous <Plate 1:7; Figs 46, 47, 59, 75>/
- #91. Spikelets <and/or clusters, whether subtended by or associated with 'involucres' or bristles representing vestigial branches (note that 'bristles' must not be confused with hairs)>/
 1. <all> unaccompanied by bractiform involucres, not associated with setiform vestigial branches <implicit>/
 2. (at least some of them) subtended by solitary 'bristles' <vestigial branches>/
 3. <or clusters> with 'involucres' of 'bristles' <vestigial branches> <ignore true hairs> <Figs 49, 50, 51>/
 4. associated with bractiform involucres <Fig. 72>/
- #92. The <reduced branch> 'bristles' <form, coalescence>/
 1. spiny, markedly coalescent basally <Fig. 50>/
 2. relatively slender, not spiny <Figs 49, 51>/
- #93. The <reduced branch> 'bristles' <whether deciduous>/
 1. persisting on the axis <Fig. 49>/
 2. deciduous with the spikelets <Figs 50, 51>/
- #94. The involucres <whether deciduous or persistent>/
 1. persistent on the rachis/
 2. shed with the fertile spikelets/
- #95. Spikelets <grouping: recorded mainly in spikes and racemes>/
 1. <mainly> solitary <Plate 1:4; Figs 30, 38, 56>/
 2. <consistently> in pairs <Plate 1:6; Fig. 44>/
 3. <consistently> in triplets <Figs 46, 52, 59>/
- #96. Spikelets <whether secund: currently a catch-all character, covering one-sidedness of inflorescence (e.g., *Dactylis*, dorsiventral rachides, etc.)>/
 1. secund <Plates 1:2, 1:4, 2:15; Figs 31, 32, 38, 39, 42, 53, 54, 55>/
 2. not secund/
- #97. Spikelets <insertion>/
 1. biseriate <on one side of the rachis> <Plate 1:4; Figs 31, 38, 39, 53, 54>/
 2. distichous <Fig. 30>/
 3. not two-ranked <not biseriate, not distichously arranged> <to become implicit>/
- #98. Spikelets <insertion — revised version>/
 1. sessile <Plate 1:9; Figs 30, 56>/
 2. subsessile <Fig. 54>/
 3. pedicellate <Plates 1:1, 1:8, 1:5, 2:10–12 etc.; Figs 34, 35, 53, 63, etc.>/
- #99. Pedicel apices <shape — recorded as yet only in Paniceae. Data mainly from R.D. Webster 1985>/
 1. oblique <Fig. 58>/
 2. truncate <Fig. 58>/
 3. discoid <Plate 2:12; Fig. 58>/
 4. cupuliform <Plates 1:8, 2:10; Fig. 57>/
- #100. Spikelets <disposition, e.g. *Diplachne*/*Leptochloa*: not widely recorded>/
 1. imbricate/
 2. distant <not overlapping>/
- #101. Spikelets <whether in regular 'long-and-short' combinations, as exemplified in typical andropogonoids>/
 1. consistently in 'long-and-short' combinations i.e., pedicellate/sessile or long-pedicel/short-pedicel pairs

- or triplets: currently includes andropogonoid forms with the pedicellate 'spikelets' reduced to their pedicels> <Plates 1:6, 1:7; Figs 28, 44, 47, 59, 72, 76>/
2. not <consistently> in distinct 'long-and-short' combinations <implicit>/
- #102. Spikelets <detail of 'long-and-short' combinations (intended mainly for andropogonoids)>/
1. in pedicellate/sessile combinations <Figs 28, 44, 47, 59>/
2. unequally pedicellate in each combination/
- #103. Pedicels of the 'pedicellate' spikelets <whether fused with the rachis: intended for andropogonoids>/
1. discernible, but <extensively> fused with the rachis <Plate 1:7; Figs 47, 60>/
2. free of the rachis <Fig. 44, 75>/
- #104. The 'shorter' <andropogonoid> spikelets <sessile or shorter-pedicelled, sexuality>/
1. hermaphrodite <Fig. 59>/
2. female-only/
3. male-only/
4. sterile/
- #105. The 'longer' <andropogonoid> spikelets <pedicelled or longer-pedicelled, sexuality>/
1. hermaphrodite/
2. female-only/
3. male-only/
4. sterile <comment if reduced to pedicels> <Figs 59, 60>/
- Female-sterile spikelets.**
- #106. <Description of female-sterile spikelets>/
- Female-fertile spikelets.**
- #107. <Female-fertile> spikelets <whether morphologically conventional>/
1. morphologically 'conventional' <with readily identifiable glumes, lemmas and paleas> <implicit>/
2. <very> unconventional <and hard to interpret>/
- #108. <Female-fertile> spikelets <approximate length, excluding any awns: data unreliable for large genera>/
- mm long/
- #109. <Female-fertile> spikelets <orientation of sessile to subsessile forms>/
1. abaxial <G1 when present on the side away from the rachis; in panicoid forms having a proximal incomplete floret, the upper (female-fertile) lemma backs onto the rachis> <Plate 1:7; Figs 59, 70, 79>/
2. adaxial <G1 when present against the rachis; in panicoid forms having a proximal incomplete floret, the upper (female-fertile) lemma is on the side away from the rachis> <Plate 1:4>/
- #110. <Female-fertile> spikelets <plane of compression>/
1. compressed laterally <lying on the side when placed on a flat surface> <Plates 1:2, 1:5, 1:9, 2:15, 2:17; Figs 30, 54, 56, 61, 67, 68, 73, 119>/
2. not noticeably compressed <terete>/
3. compressed <dorsally, ventrally or> dorsiventrally <lying on front or back when placed on a flat surface> <Plates 1:4, 1:7, 2:10, 2:11; Figs 70, 74, 75, 82, 97, 98>/
- #111. <Female-fertile> spikelets <shape of 'dorsiventrally flattened' forms>/
1. planoconvex/
2. biconvex/
- #112. <Female-fertile> spikelets <location of disarticulation positions>/
1. <readily> disarticulating above the glumes <when mature>/
2. falling with the glumes <when mature> <pending data changes, including forms where the spikelets are shed by inflorescence disarticulation>/
3. not disarticulating <common in cultivated cereals>/
- #113. <Female-fertile> spikelets <whether rachilla disarticulates between the florets of spikelets with two or more fertile florets>/
1. not disarticulating between the florets/
2. disarticulating between the florets/
- #114. <Female-fertile> spikelets <rachilla internode spacings: unsatisfactorily defined, and inadequately scored for treating state 1 as implicit>/
1. with conventional internode spacings/
2. with a distinctly elongated rachilla internode between the glumes <Fig. 62>/
3. with a distinctly elongated rachilla internode above the glumes <Figs 63, 64, 81>/
4. with distinctly elongated rachilla internodes between the florets/
- #115. <Presence or absence of *Ichnanthus*-type stipe: Paniceae>/
1. the upper floret conspicuously stipitate <Fig. 64>/
2. the upper floret not stipitate/
- #116. The stipe beneath the upper floret <thickness: *Ichnanthus* relatives>/
1. filiform/
2. not filiform <Fig. 64>/
- #117. The stipe beneath the upper floret <shape: *Ichnanthus* relatives>/
1. straight and swollen <Fig. 64>/
2. curved, not swollen/
- #118. The stipe beneath the upper floret <whether heterogeneous Zuloaga 1987>/
1. heterogeneous <membranous towards the base of the palea, indurated on the lemma side>/
2. homogeneous/
- #119. Rachilla <of female-fertile spikelets, whether terminated by a female-fertile floret, or 'prolonged'>/
1. prolonged beyond the uppermost female-fertile floret <i.e. not terminated by a female-fertile floret: note that 'racemose' spikelets with three or more female-fertile florets have all been awarded this state> <Figs 41, 56, 61, 65>/
2. terminated by a female-fertile floret <not 'prolonged'>/
- #120. Rachilla <of female-fertile spikelets, whether hairy>/
1. hairy <between the female-fertile florets, or above the single one>/
2. hairless/
- #121. The rachilla extension <beyond the uppermost female-fertile floret of female-fertile spikelets, rudiments>/
1. with incomplete florets/
2. naked/
- #122. Callus <presence/length: data very incomplete>/
1. absent/
2. short/
3. long <Fig. 100>/
- #123. Callus <whether blunt or pointed>/
1. pointed <Figs 28, 100>/
2. blunt/
- #124. Hairy callus <presence: an unsatisfactory catch-all character, but widely recorded and useful in keys>/
1. present <Figs 28, 63, 72, 100>/
2. absent/
- #125. Callus hairs <presence, size: *Calamagrostis*/*Agrostis*>/
1. present, more than 0.5 mm long/
2. absent, or if present less than 0.5 mm long/
- #126. Glumes <of female-fertile spikelets, present or absent>/
1. present <implicit>/
2. absent/
- #127. Glumes <of female-fertile spikelets, number: 'glumes' are barren, with neither axillary spikelets nor florets>/
1. one per spikelet/
2. two/
3. several/
- #128. Glumes <whether glumes of the female-fertile spikelets are all minute>/
1. minute <relative to the rest of the spikelet> <Plate 1:2; Fig. 63>/
2. relatively large <implicit>/
- #129. Glumes <of female-fertile spikelets, whether markedly unequal in the intact spikelet; regardless of any differences in form>/
1. very unequal <in length in the intact spikelet> <Plates 1:8, 2:10, 2:12; Figs 61, 68, 71>/
2. more or less equal <in length in the intact spikelet> <Plates 1:1, 1:7, 2:11; Figs 62, 66, 73, 79, 85, 89, 114, 119>/
- #130. Glumes <length relative to the spikelet — applied only to spikelets with 2 or more florets> <currently for key-making only>/
1. markedly shorter than the spikelets <Figs 61, 68>/
2. about equalling the spikelets <Plate 1:8; Figs 62, 93>/
3. much exceeding the spikelets <Figs 66, 67, 73, 85, 114>/
- #131. Glumes <of female-fertile spikelets, lengths relative to proximal (adjacent) lemmas. Refers to the longer

- glume when glumes unequal>/
 1. decidedly shorter than the adjacent lemmas <in intact spikelets> <Figs 61, 68, 89>/
 2. long relative to the adjacent lemmas <more or less equalling or exceeding them> <Plates 1:1, 1:7, 1:8, 2:15, 2:16; Figs 62, 66, 67, 71, 73, 79, 85, 114, 119>/
- #132. Glumes <of female-fertile spikelets, whether free or joined>/
 1. joined <at least basally>/
 2. free <implicit>/
- #133. Glumes <of female-fertile spikelets, whether ventricose>/
 1. conspicuously ventricose <basally> <Fig. 69>/
 2. not ventricose <implicit>/
- #134. Glumes <of sessile to subsessile female-fertile spikelets, position relative to rachis>/
 1. dorsiventral to the rachis <the entire spikelet orientated dorsiventrally to flatwise> <Plates 1:7, 1:9; Figs 56, 70, 79>/
 2. lateral to the rachis <the spikelets borne flatwise>/
 3. displaced <e.g., lateral to each other on side away from rachis>/
- #135. Glumes <of female-fertile spikelets, whether hairy>/
 1. hairy <Plates 1:1, 1:3, 1:8, 2:12, 2:13, 2:15, 2:16; Figs 52, 61>/
 2. hairless <Plate 1:5; Fig. 73>/
- #136. Glumes <hairless, whether glabrous or scabrous>/
 1. glabrous <Plate 1:8; Fig. 73>/
 2. scabrous <Plate 1:5>/
- #137. Glumes <of female-fertile spikelets, hair disposition>/
 1. with distinct hair tufts/
 2. with distinct rows of hairs/
 3. without conspicuous tufts or rows of hairs/
- #138. Glumes <of female-fertile spikelets, shape of apex>/
 1. pointed <Plates 1:3, 1:5, 2:13, 2:17; Figs 61, 67, 79, 85>/
 2. not pointed <blunt or incised>/
- #139. Glumes <of female-fertile spikelets, shape>/
 1. subulate/
 2. not subulate <to become implicit>/
- #140. Glumes <of female-fertile spikelets, whether awned>/
 1. awned <Plates 1:1, 2:15; Fig. 32>/
 2. awnless <Fig. 73>/
- #141. Glumes <of female-fertile spikelets, whether carinate (i.e., one-keeled to middle or below)>/
 1. carinate <one-keeled> <Plates 1:5, 2:17; Figs 54, 67, 73, 89, 114>/
 2. non-carinate <includes forms with more than one keel, as well as those with non-keeled glumes> <Plates 1:5, 1:7>/
- #142. Glumes <of female-fertile spikelets, whether conspicuously winged on the median keel>/
 1. with the keel conspicuously winged <Fig. 73>/
 2. without a median keel-wing <implicit>/
- #143. Glumes <of female-fertile spikelets, whether markedly dissimilar in form or texture; ignore mere size difference>/
 1. very dissimilar <specify> <Plates 1:7, 2:10, 2:12; Figs 59, 61>/
 2. <more or less> similar <Plates 1:1, 2:11; Figs 66, 67, 73, 81, 85, 89>/
- #144. Lower glume <in situ length relative to upper glume of female-fertile spikelet: not recorded if glumes more or less equal>/
 times the length of the upper glume/
- #145. Lower glume <length relative to lowest lemma: not widely recorded>/
 1. shorter than the lowest lemma/
 2. about equalling the lowest lemma/
 3. much exceeding the lowest lemma/
- #146. Lower glume <length relative to the lowest lemma (originally introduced to deal with *Colpodium Catabrosa*)>/
 1. much shorter than half length of lowest lemma/
 2. longer than half length of lowest lemma/
- #147. Lower glume <of female-fertile spikelets, whether distinctly two-keeled to the middle or below (intended mainly for andropogonoids)>/
 1. two-keeled <distinctly two-keeled to the middle or below> <Plate 1:7; Figs 74, 75>/
 2. not two-keeled <not distinctly two-keeled, at least below the upper quarter> <Fig. 72>/
- #148. Lower glume <of female-fertile spikelets, shape of back (recorded mainly for andropogonoids)>/
 1. convex on the back <Plate 1:7; Fig. 72>/
 2. flattened on the back <Fig. 74>/
 3. concave <between the keels> on the back/
 4. sulcate on the back/
- #149. Lower glume <of female-fertile spikelet, whether pitted with 1–3 pits, cf. *Bothriochloa*; not synonymous with lacunose, qv. (intended for andropogonoids)>/
 1. conspicuously pitted <Fig. 74>/
 2. not pitted/
- #150. Lower glume <of female-fertile spikelet, texture (intended mainly for andropogonoids)>/
 1. smooth <Plate 1:7; Fig. 60>/
 2. lacunose with <several-to-many> deep depressions <Figs 75, 76>/
 3. rugose/
 4. tuberculate <Fig. 59>/
 5. muricate/
 6. spiny <Fig. 77>/
- #151. Lower glume <of female-fertile spikelet, mid-zone nerve number>/
 nerved/
- #152. Upper glume <whether saccate: e.g. *Sacciolepis*>/
 1. distinctly saccate/
 2. not saccate <implicit>/
- #153. Upper glume <(or the single glume) of female-fertile spikelets, mid-zone nerve number>/
 nerved/
- #154. Upper glume <whether spiny>/
 1. spiny/
 2. not spiny <implicit>/
- #155. <Female-fertile> spikelets <whether containing sterile or male-only florets in addition to female-fertile florets>/
 1. <normally> with female-fertile florets only/
 2. <or at least some of them, normally> with incomplete <sterile or male-only> florets <note that the situation at the apex of spikelets with more than three florets is often unknown or unclear> <Plates 1:8, 2:10, 2:12, 2:13, 2:16; Figs 61, 64, 71, 78, 79>/
- #156. The incomplete <male or sterile> florets <position in spikelet>/
 1. proximal to the female-fertile florets <Plates 1:8, 2:12, 2:13, 2:16; Figs 64, 71, 79>/
 2. distal to the female-fertile florets <Figs 61, 78>/
 3. both distal and proximal to the female-fertile florets/
- #157. The distal <incomplete> florets <specialisation>/
 1. merely underdeveloped <neither clearly specialised nor peculiarly modified in form> <Fig. 61>/
 2. clearly specialised and modified in form <Fig. 78>/
- #158. The distal <incomplete> florets <whether awned: data very incomplete>/
 1. awned <Fig. 78>/
 2. awnless/
- #159. <Female-fertile> spikelets <presence or absence of proximal incomplete florets. Strictly speaking, a redundant character, but universally recorded and very useful for key-making>/
 1. with proximal incomplete florets <includes empty lemmas> <Plates 1:8, 2:10, 2:12, 2:13, 2:16; Figs 64, 71, 79, 80, 84>/
 2. without proximal incomplete florets <and no proximal empty lemmas>/
- #160. Proximal incomplete florets <of the female-fertile spikelets, when present, number (intended mainly for panicoids)>/
- #161. Proximal incomplete florets <of the female-fertile spikelets, whether paleate>/
 1. paleate <Plate 2:13; Figs 71, 79, 80>/
 2. epaleate <Fig. 64>/
- #162. Palea of the proximal incomplete florets <development>/
 1. fully developed <Fig. 84>/
 2. reduced <or vestigial> <Plate 2:13; Fig. 80>/
- #163. Palea of the proximal incomplete florets <whether becoming hardened and enlarged laterally: Paniceae>/
 1. becoming conspicuously hardened and enlarged laterally/
 2. not becoming conspicuously hardened and enlarged laterally/

- #164. Proximal incomplete florets <of the female-fertile spikelets: sexuality>/
1. male <Plate 2:13; Figs 71, 79, 80>/
2. sterile <Plate 2:16>/
- #165. <Proximal lemmas: shape comments>/
- #166. The proximal <imperfect> lemmas <of the female-fertile spikelets: whether awned>/
1. awned/
2. awnless/
- #167. The proximal <imperfect> lemmas <of the female-fertile spikelets, mid-zone nerve number (intended mainly for panicoids)>/
nerved/
- #168. The proximal <imperfect> lemmas <of the female-fertile spikelets, length relative to the female-fertile ones in the intact spikelet (intended mainly for panicoids)>/
1. exceeded by the female-fertile lemmas <Fig. 80>/
2. more or less equalling the female-fertile lemmas <Fig. 82>/
3. decidedly exceeding the female-fertile lemmas <Plates 2:12, 2:16; Figs 64, 71, 84>/
- #169. The proximal <imperfect> lemmas <of the female-fertile spikelets, firmness relative to the female-fertile ones (intended mainly for panicoids)>/
1. less firm than the female-fertile lemmas <Plate 2:16; Figs 64, 71, 80>/
2. similar in texture to the female-fertile lemmas/
3. decidedly firmer than the female-fertile lemmas/
- #170. The proximal <imperfect> lemmas <of the female-fertile spikelets, whether becoming indurated (intended mainly for panicoids)>/
1. becoming indurated/
2. not becoming indurated <Plate 2:16; Fig. 84>/
- #171. <Number of> female-fertile florets <per female-fertile spikelet>/
- #172. <Female-fertile> lemmas <insertion>/
1. conspicuously non-distichous/
2. not conspicuously non-distichous <implicit>/
- #173. <Female-fertile> lemmas <shape comments>/
- #174. <Female-fertile> lemmas <whether convolute>/
1. convolute <and hiding the palea> <Fig. 85>/
2. not convolute <implicit: but data not yet reliable>/
- #175. <Female-fertile> lemmas <whether saccate>/
1. saccate <Figs 81, 89>/
2. not saccate <to become implicit: but not yet reliably so>/
- #176. <Female-fertile> lemmas <firmness, relative to the glumes>/
1. less firm than the <firmer of the> glumes/
2. similar in texture to the <firmer of the> glumes/
3. decidedly firmer than the <firmer of the> glumes <Plate 2:16; Figs 64, 71, 81, 89, 114>/
- #177. <Female-fertile> lemmas <texture: data provided for Australian Paniceae by R.D. Webster>/
1. smooth <Figs 64, 81>/
2. <longitudinally, minutely> striate <rugulose> <Fig. 82>/
3. <transversely> rugose <Figs 83, 114>/
- #178. <Female-fertile> lemmas <whether becoming indurated>/
1. becoming indurated <cf. fingernails, when mature and dry> <Plates 2:11, 2:16; Figs 81, 83, 85, 114>/
2. not becoming indurated <hyaline, membranous, leathery, cartilaginous etc.> <Fig. 71>/
- #179. <Female-fertile> lemmas <shape of apex>/
1. entire <Figs 91, 97>/
2. incised <Plate 2:18; Figs 66, 86, 87, 91>/
- #180. <Female-fertile> lemmas <entire, whether pointed or blunt>/
1. pointed <Fig. 97>/
2. blunt <Figs 88, 101>/
- #181. <Female-fertile> lemmas <number of lobes>/
lobed/
- #182. <Female-fertile> lemmas <whether deeply cleft>/
1. deeply cleft <to a third or more> <Plate 2:18; Figs 66, 86, 87>/
2. not deeply cleft <Fig. 91>/
- #183. <Female-fertile> lemmas <whether crested, cf. *Cyrtococcum*>/
1. crested at the tip <Fig. 89>/
2. not crested <implicit>/
- #184. <Female-fertile> lemmas <whether mucronate or awned>/
1. awnless <neither mucronate nor awned> <Figs 68, 71, 73, 89 etc.>/
2. mucronate <with a short, hard point or vestigial or incipient awn> <Plate 2:16; Fig. 104>/
3. awned <Plates 1:5, 1:6, 2:18; Figs 56, 61, 66, 67, 85, 87, 90, 91, 114>/
- #185. Awns <of female-fertile lemmas, form>/
1. triple or trifid, commonly with a basal column <*Aristida* type> <Figs 92, 96>/
2. not of the triple/trifid, basal column type <implicit>/
- #186. Awns <of female-fertile lemmas, if present, number>/
- #187. Awns <of female-fertile lemmas, position>/
1. median <Figs 56, 61, 67, 91>/
2. median and lateral <Plate 2:18; Figs 66, 86, 87>/
3. lateral only/
- #188. The median awn <whether different from the laterals in form>/
1. different in form from the laterals <Figs 66, 86>/
2. similar in form to the laterals <Plate 2:18; Fig. 87>/
- #189. Awns <of female-fertile lemmas, position of (main, median)>/
1. from the sinus <Figs 86, 91>/
2. dorsal <Figs 56, 67, 90>/
3. apical <Plate 1:5; Figs 61, 85, 87, 91, 92, 96, 114>/
- #190. Awns <of dorsally awned female-fertile lemmas, position>/
1. from near the top <from the upper quarter, or near the apex, or just behind an apical notch> <Fig. 56>/
2. from well down the back <from near the middle, or below> <Figs 67, 90>/
- #191. Awns <of female-fertile lemmas, whether straight or geniculate when dry>/
1. non-geniculate <straight or curved> <Plates 1:5, 2:18; Figs 56, 61, 87>/
2. geniculate <usually twisted at the base> <Figs 66, 67, 86, 90>/
- #192. Awns <main, median of the female-fertile lemmas, hairiness>/
1. hairless <glabrous or scabrous> <Figs 61, 67, 92>/
2. hairy <but not long-plumose> <Fig. 91>/
3. long-plumose <Plate 2:18; Figs 87, 96>/
- #193. Awns <main, median of the female-fertile lemmas, relative length>/
1. much shorter than the body of the lemma <Plate 1:5>/
2. about as long as the body of the lemma/
3. much longer than the body of the lemma <Plates 1:6, 2:18; Figs 61, 66, 67, 86, 87, 91>/
- #194. Awns <of female-fertile lemmas, number of veins entering base>/
1. entered by one vein <Fig. 94>/
2. entered by several <three or more> veins <Fig. 95>/
- #195. Awns <of female-fertile lemmas, whether deciduous — e.g. *Stipa*/*Oryzopsis*>/
1. deciduous/
2. persistent <to become implicit>/
- #196. The lateral awns <relative length>/
1. shorter than the median <in the intact spikelet> <Figs 66, 86>/
2. about equalling the median/
3. exceeding the median/
- #197. <Female-fertile> lemmas <whether hairy: excludes callus and awns>/
1. <conspicuously> hairy <Plate 1:2; Figs 66, 86, 90>/
2. hairless <glabrous, scabrous, sparsely puberulent, etc.> <Plate 2:16; Figs 61, 64>/
- #198. The hairs <of the female-fertile lemmas>/
1. in tufts <Figs 66, 86>/
2. not in tufts <implicit>/
- #199. The hairs <of the female-fertile lemmas>/
1. in transverse rows <Figs 66, 86>/
2. not in transverse rows <implicit>/
- #200. <Female-fertile> lemmas <hairless, whether glabrous or scabrous>/
1. glabrous/
2. scabrous/
- #201. <Female-fertile> lemmas <whether carinate (i.e., one-keeled at least to the middle on the back)>/
1. carinate <with a single median keel> <Plate 1:2; Figs 54, 68>/
2. non-carinate <rounded, flat, with two or more keels> <Figs 82, 83, 86, 90, 91>/
- #202. <Female-fertile> lemmas <whether margins *Digitaria* or *Paspalum* type (intended for Paniceae)>/
1. having the margins at least over the upper two-thirds lying flat and exposed on the palea <*Digitaria*-type> <Plate 2:13; Fig. 97>/

2. having the margins <at least over the lower two-thirds> tucked in onto the palea
<*Paspalum*-type> <Plate 2:16; Fig. 98>/
- #203. <Female-fertile> lemmas <presence of germination flap>/
 1. with a clear germination flap <when mature> <Figs 99, 100>/
 2. without a germination flap/
- #204. <Female-fertile> lemmas <number of nerves traversing mid-region>/
 - nerved/
- #205. <Female-fertile> lemmas <confluence of nerves: data very incomplete>/
 1. with the nerves confluent towards the tip/
 2. with the nerves non-confluent apically <Fig. 101>/
- #206. Palea <presence in female-fertile florets>/
 1. present <within the female-fertile lemma>/
 2. absent/
- #207. Palea <female-fertile, relative size>/
 1. relatively long <three-quarters or more of female-fertile lemma length> <Plates 2:13, 2:16; Figs 102, 104>/
 2. conspicuous but relatively short <less than three-quarters of female-fertile lemma length> <Fig. 88>/
 3. very reduced <or vestigial>/
- #208. Palea <female-fertile, whether convolute>/
 1. convolute/
 2. not convolute <implicit: but data not yet reliable>/
- #209. Palea <female-fertile, whether gaping: especially *Aveneae*>/
 1. gaping/
 2. tightly clasped by the lemma <not gaping>/
- #210. Palea <female-fertile, whether incised>/
 1. entire <Fig. 106>/
 2. apically notched <Fig. 103>/
 3. deeply bifid/
- #211. Palea <female-fertile, whether with awns or setae>/
 1. awnless, without apical setae <Figs 102, 103>/
 2. with apical setae <Fig. 104>/
 3. awned/
- #212. Palea <texture: data very incomplete>/
 1. thinner than the lemma/
 2. similar in texture to the lemma <Plates 2:11, 2:16; Figs 81, 97, 98>/
- #213. Palea <female-fertile, whether indurated>/
 1. indurated <Plates 2:11, 2:16; Figs 81, 87>/
 2. not indurated <Figs 103, 105 etc.>/
- #214. Palea <female-fertile, nerve number>/
 1. 1-nerved <truly 1-veined, or with two contiguous veins>/
 2. 2-nerved <with two well-separated nerves> <Figs 102, 103, 106>/
 3. with several nerves <specify>/
 4. nerveless/
- #215. Palea <female-fertile, whether dorsally 2-keeled, one-keeled (carinate), or keel-less>/
 1. one-keeled/
 2. 2-keeled <Figs 65, 88, 102, 103, 105, 106>/
 3. keel-less/
- #216. Palea keels <whether winged: data very incomplete>/
 1. winged <Figs 105, 106>/
 2. wingless <Fig. 102>/
- #217. Palea keels <female-fertile, hairiness>/
 1. glabrous/
 2. scabrous <Fig. 105>/
 3. hairy <Figs 102, 103>/
- #218. Lodicules <presence in female-fertile florets>/
 1. present/
 2. absent/
- #219. Lodicules <number>/
- #220. <Presence of third lodicule>/
 1. third lodicule present <Fig. 108>/
 2. no third lodicule/
- #221. Lodicules <of female-fertile florets, whether anterior pair joined or free>/
 1. joined <at least basally> <Fig. 106>/
 2. free <Figs 103, 107–111>/
- #222. Lodicules <of female-fertile florets, texture>/
 1. <distally> fleshy <'cuneate'; panicoid type> <Figs 103, 106, 107, 109>/
 2. <distally> membranous <i.e. pooid type> <Plate 2:14; Figs 108, 110, 111>/
- #223. Lodicules <of female-fertile florets, whether hairy>/
 1. ciliate <or hairy> <Figs 103, 108, 110>/
 2. glabrous <Figs 106, 107, 109, 111>/
- #224. Lodicules <of female-fertile florets, whether toothed>/
 1. toothed/
 2. not toothed/
- #225. Lodicules <of female-fertile florets, vascularization. Note: this fairly unsatisfactory character is not equivalent to 'presence or absence' of xylem>/
 1. heavily vascularized <cf. bamboos> <Figs 108, 112>/
 2. not or scarcely vascularized <i.e. the norm> <Figs 103, 106, 107, 109–111>/
- #226. Stamens <number per female-fertile floret (not applicable to male spikelets or male florets)>/
- #227. Stamens <whether filaments joined>/
 1. with free filaments <implicit>/
 2. monadelphous/
 3. diadelphous/
 4. triadelphous/
- #228. Anthers <of female-fertile florets, length: data very incomplete, unreliable for large genera>/
 - mm long/
- #229. Anthers <whether penicillate>/
 1. penicillate <Fig. 114>/
 2. not penicillate <Fig. 113>/
- #230. Anthers <whether connective apically prolonged>/
 1. with the connective apically prolonged/
 2. without an apically prolonged connective/
- #231. Ovary <of female-fertile florets, whether apex glabrous or hairy>/
 1. glabrous <Plate 2:14; Figs 103, 106, 116, 118>/
 2. hairy <Figs 110, 112, 115, 117>/
- #232. Ovary <whether with a conspicuous apical appendage>/
 1. with a conspicuous apical appendage <Fig. 115>/
 2. without a conspicuous apical appendage <implicit> <Figs 103, 116, 117>/
- #233. The <ovary> appendage <form: intended for bamboos>/
 1. long, stiff and tapering/
 2. broadly conical, fleshy/
- #234. Styles <whether fused>/
 1. fused <at least basally; each stigma assumed to represent one style> <Figs 107, 112, 117, 118>/
 2. free to their bases <Figs 103, 107, 110, 116>/
- #235. Stigmas <number>/
- #236. Stigmas <colour, in chasmogamous spikelets>/
 1. white <Plates 1:2, 1:5, 1:7, 2:14; Figs 110, 111, 115>/
 2. red <anthocyanin> pigmented <i.e. red, pink, purple or black> <Plates 1:3, 1:4, 1:6, 1:8, 2:10 etc.; Figs 79, 107>/
 3. <golden> brown <Plate 2:12>/

Fruit, embryo and seedling.

- #237. Disseminule <constitution: data not yet entered>/
 1. a naked seed/
 2. a free caryopsis/
 3. a caryopsis enclosed in but free of the lemma and palea/
 4. a caryopsis enclosed within and partially fused with the lemma and palea/
 5. consisting of the abscised spikelet/
 6. consisting of the abscised spikelet and its pedicel/
 7. comprising the rachis segment and associated structures/
 8. consisting of the disarticulated spikelet-bearing inflorescence unit/
 9. constituted by the complete, deciduous inflorescence/
- #238. Fruit <adherence>/
 1. adhering to lemma and/or palea <Fig. 123>/
 2. free from both lemma and palea <but may be enclosed>/
- #239. Fruit <length when mature>/
 1. small <less than 4 mm>/
 2. medium sized <4–10 mm>/
 3. large <more than 10 mm long>/
- #240. Fruit <shape>/
 1. linear/
 2. fusiform/
 3. banana-shaped/
 4. ellipsoid <Fig. 121>/
 5. subglobose/
 6. pyriform/
- #241. Fruit <whether grooved in transverse section>/
 1. longitudinally grooved <sulcate> <Fig. 121>/

2. not grooved <includes terete, triangular in section, etc.; specify> <Figs 122–124>/
 - #242. Fruit <plane of compression>/
 1. compressed laterally/
 2. compressed <dorsally, ventrally or> dorsiventrally <Figs 121–123>/
 3. not noticeably compressed <Figs 119–120>/
 4. trigonous/
 - #243. Fruit <or grain surface pattern>/
 1. sculptured <Fig. 127>/
 2. <relatively> smooth <the near-universal condition> <Figs 121–126>/
 - #244. Fruit <hair distribution>/
 1. with hairs confined to a terminal tuft <Fig. 121>/
 2. hairy on the body/
 - #245. Hilum <form>/
 1. short <punctiform or shortly elliptical, less than half length of fruit> <Figs 122, 124>/
 2. long-linear <more than half as long as fruit> <Figs 121, 123>/
 - #246. Pericarp <texture>/
 1. thin <Figs 119–126>/
 2. thick and hard/
 3. fleshy <fruit a berry>/
 - #247. Pericarp <whether fused or loose (or free)>/
 1. free <Figs 119, 120>/
 2. loosely adherent <fairly easily removable when soaked>/
 3. fused <Figs 121–126>/
 - #248. Embryo <relative size>/
 1. large <at least one-third as long as fruit> <Fig. 125>/
 2. small <less than one-third as long as fruit> <Fig. 126>/
 - #249. Embryo <whether waisted in surface view>/
 1. waisted <Fig. 125>/
 2. not waisted <Fig. 126>/
 - #250. Seed <whether endospermic>/
 1. endospermic <implicit>/
 2. not endospermic/
 - #251. Endosperm <hard or liquid: data extensively from Terrell 1971, Rosengurt *et al.* 1972>/
 1. liquid <soft or milky> in the mature fruit/
 2. hard/
 - #252. Endosperm <presence of lipid: data mainly from Rosengurt *et al.* 1972>/
 1. with lipid/
 2. without lipid/
 - #253. Endosperm <form of starch grains: data mainly from Tateoka 1954, 1955, 1962>/
 1. containing only simple starch grains <each with only one hilum> <Fig. 129>/
 2. containing <at least some> compound starch grains <with at least some grains having two or more hila> <Fig. 128>/
 - #254. Embryo <presence of epiblast. Embryo section data extensively from Reeder 1967, 1962 and Decker 1964>/
 1. with an epiblast <Fig. 132>/
 2. without an epiblast <Fig. 133>/
 - #255. Embryo <presence of scutellar tail>/
 1. with a scutellar tail <i.e. with a cleft between scutellum and coleorhiza> <Figs 132, 133>/
 2. without a scutellar tail/
 - #256. Embryo <relative length of mesocotyl internode>/
 1. with an elongated mesocotyl internode <Figs 132, 133>/
 2. with a negligible <short> mesocotyl internode/
 - #257. Embryo <number of scutellum bundles>/
 1. with one scutellum bundle <Fig. 131>/
 2. with more than one scutellum bundle/
 - #258. Embryonic leaf margins <whether overlapping or meeting>/
 1. meeting <Fig. 131>/
 2. overlapping <Fig. 130>/
 - #259. Seedling <relative length of mesocotyl: compiled data probably unreliable, because germination conditions should be standardized>/
 1. with a short mesocotyl <Figs 135, 136>/
 2. with a long mesocotyl <Figs 134, 137, 138>/
 - #260. Seedling <tightness of coleoptile: data extensively from Muller 1978>/
 1. with a loose coleoptile <at least near tip> <Fig. 135>/
 2. with a tight coleoptile/
 - #261. First seedling leaf <possession of lamina>/
 1. with a well-developed lamina/
 2. without a lamina/
 - #262. The <first seedling leaf> lamina <relative width: data on seedling leaf characters mainly from Kuwabara 1960, 1961 and H.T. Clifford (*pers. comm.*)>/
 1. broad <length/breadth, ratio less than 20> <Figs 134, 137, 138>/
 2. narrow <length/breadth ratio 20 or more> <Fig. 136>/
 - #263. The <first seedling leaf> lamina <carriage>/
 1. erect <Fig. 136>/
 2. curved <Figs 134, 137>/
 3. supine <Fig. 138> <Fig. 138>/
 - #264. The <first seedling leaf> lamina <vein number, in middle>/
 - veined/
- Abaxial leaf blade epidermis.**
- #265. Microhairs <presence in abaxial leaf blade epidermis>/
 1. present <Plates 3:19, 3:22; Figs 139–142, 145, 149, 150, 152, 156, 160, 161, 164, 172, 174, 180, 182, 186 etc.>/
 2. absent/
 - #266. Microhairs <of abaxial leaf blade epidermis, shape>/
 1. more or less spherical/
 2. elongated <to become implicit>/
 - #267. Microhairs <of abaxial leaf blade epidermis, number of cells visible>/
 1. ostensibly one-celled <usually indicative of a sunken basal cell>/
 2. clearly two-celled <to become implicit>/
 3. uniseriate/
 - #268. Microhairs <of abaxial leaf blade epidermis, form>/
 1. panicoid-type <distal cell more or less parallel-sided or tapered to the apex; usually relatively elongated, thin-walled, often collapsed or missing> <Plate 3:22; Figs 139, 140, 149, 152, 156, 160–162, 164, 174, 177, 186>/
 2. chloridoid-type <distal cell inflated or more or less hemispherical, relatively short, usually thick-walled relative to the panicoid type, persistent> <Plate 3:19; Figs 141, 170, 180>/
 3. *Enneapogon*-type <long, with very long basal cell and relatively short, inflated apical cell> <Fig. 142>/
 - #269. Microhairs <whether with 'partitioning membranes'>/
 1. with 'partitioning membranes'/
 2. without 'partitioning membranes'/
 - #270. The 'partitioning membranes' <location>/
 1. in the basal cell/
 2. in the apical cell/
 - #271. Microhairs <of abaxial leaf blade, total external length: for species sample, see attached list plus Metcalfe 1960>/
 - microns long/
 - #272. Microhairs <of abaxial leaf blade, width at the septum: for species sample, see attached list>/
 - microns wide at the septum/
 - #273. Microhair apical cells <of abaxial leaf blade, length: for species sample, see the attached list plus Metcalfe 1960>/
 - microns long/
 - #274. Microhair apical cell/total length ratio <for species sample, see attached list plus Metcalfe 1960. Useful approximations: 0–0.3 (a.c. markedly shorter than b.c.); 0.3–0.7 (a.c. and b.c. about equal); 0.7–1.0 (a.c. markedly longer than b.c.)>/
 - #275. Microhair total length/width at septum <for species sample, see attached list. Useful ranges: 0.5–1.5 (more or less spherical); 1.5–3 (decidedly plump); 3–8 (narrow); 8–40 (very narrow)>/
 - #276. <Whether abaxial leaf blade epidermis shows> costal/intercostal zonation/
 1. conspicuous <Plates 3:19, 3:21, 3:22; Figs 139–141, 143, 146, 147, 151–153, 158, 169–174 etc.>/
 2. lacking <Figs 144, 185>/
 - #277. Intercostal zones <of abaxial leaf blade epidermis, whether of typical long-cells>/
 1. <fairly exclusively> of typical long-cells <Figs 139, 143, 144, 148, 152, 160, 169, 170, 172, 184, 186 etc.>/
 2. having many atypical long-cells <Figs 153, 174>/
 3. without typical long-cells <Fig. 146>/

- #278. Long-cells <of abaxial leaf blade epidermis, whether similar in shape costally and intercostally>/
1. similar in shape costally and intercostally <Figs 178, 180>/
 2. markedly different in shape costally and intercostally <Plate 3:21; Figs 172–174, 176, 186>/
- #279. Long-cells <of abaxial leaf blade epidermis, whether similar in thickness costally and intercostally>/
1. of similar wall thickness costally and intercostally <Figs 178, 180, 186>/
 2. differing markedly in wall thickness costally and intercostally <Fig. 147>/
- #280. Mid-intercostal long-cells <of abaxial leaf blade epidermis, shape>/
1. more or less rectangular <Plates 3:19, 3:21; Figs 139, 143, 145, 147, 149–152, 159, 160, 163, 164, 169, 170, 172, 173, 176, 177, 179, 180, 184–186>/
 2. more or less fusiform <or narrowed at ends> <Plate 3:20; Figs 144, 145, 148, 163, 176, 184>/
- #281. Mid-intercostal long-cells <of abaxial leaf blade epidermis, whether walls straight or sinuous in (outer) optical section>/
1. having markedly sinuous <tessellated> walls <Plates 3:19, 3:21; Figs 139, 143, 145, 147, 149, 150, 153, 159, 160, 164, 165, 168–175, 177–180, 182–186>/
 2. having straight or only gently undulating walls <Plate 3:20; Figs 144, 145, 148, 156, 163, 166, 181>/
- #282. Papillae <presence in the abaxial leaf blade epidermis>/
1. present <Plates 3:19, 3:22; Figs 139–141, 151–153, 160, 174, 179, 181>/
 2. absent/
- #283. <Leaf blade abaxial epidermal> papillae <general location: data very incomplete>/
1. costal <Figs 153, 160>/
 2. intercostal <Plate 3:22; Figs 151–153, 160>/
- #284. <Leaf blade abaxial epidermal> papillae <whether on the subsidiaries: data very incomplete>/
1. present on the subsidiaries <Fig. 139>/
 2. absent from the subsidiaries <Figs 140, 152, 153>/
- #285. Intercostal papillae <of the abaxial leaf blade epidermis, whether over-arching the stomata (at least at one end)>/
1. <frequently> over-arching the stomata <Plate 3:22; Figs 140, 151, 152, 181>/
 2. not over-arching the stomata <Figs 174, 179>/
- #286. Intercostal papillae <of the abaxial leaf blade epidermis, form, arrangement>/
1. consisting of one oblique swelling per cell <Plate 3:22; Figs 140, 152, 181>/
 2. consisting of one symmetrical <conical or finger-like> projection per cell <Plate 3:19; Figs 151, 174>/
 3. several per cell <specify appearance> <Figs 139, 153, 179>/
- #287. Crown cells <presence in the abaxial leaf blade epidermis>/
1. present <Fig. 154>/
 2. absent/
- #288. Costal regions <of the abaxial leaf blade epidermis, presence of horizontally elongated-sinuous or elongated-crenate silica bodies>/
1. with 'pooid-type' <horizontally elongated-sinuous or elongated-crenate> silica bodies <Plate 3:20; Figs 148, 155>/
 2. without <significant numbers of> 'pooid-type' silica-bodies/
- #289. Costal regions <of the abaxial leaf blade epidermis, presence of cross-to-dumb-bell shaped or nodular silica bodies>/
1. with 'panicoid type' <cross-shaped to dumb-bell shaped or nodular> silica bodies <specify> <Plates 3:21, 3:22; Figs 139–141, 143, 145, 149, 152, 156, 169, 171, 173, 175–177, 180–182, 184–186>/
 2. without <significant numbers of> 'panicoid-type' silica bodies/
- #290. Costal regions <of the abaxial leaf blade epidermis, presence of tall-and-narrow silica bodies>/
1. with tall-and-narrow silica bodies <Fig. 157>/
 2. without <significant numbers of> tall-and-narrow silica bodies/
- #291. Costal regions <of the abaxial leaf blade epidermis, presence of saddle-shaped (chloridoid-type) silica bodies>/
1. with saddle-shaped silica bodies <Plate 3:19; Figs 150, 151, 158, 170>/
 2. without <significant numbers of> saddle-shaped silica bodies/
- #292. Costal regions <of the abaxial leaf blade epidermis, presence of crescentic silica bodies>/
1. with crescentic silica bodies <Figs 159, 170>/
 2. without <significant numbers of> crescentic silica bodies/
- #293. Costal regions <of the abaxial leaf blade epidermis, presence of oryzoid-type silica bodies: i.e. vertically orientated dumb-bells or nodules>/
1. with oryzoid silica bodies <Figs 139, 160, 164>/
 2. without <significant numbers of> oryzoid silica bodies/
- #294. Costal regions <of the abaxial leaf blade epidermis, presence of silica bodies with sharp points; includes 'acutely-angled' *sensu* Metcalfe>/
1. with sharp-pointed silica bodies <Figs 146, 161, 164, 173, 181>/
 2. without <significant numbers of> sharp-pointed silica bodies/
- #295. Costal regions <of the abaxial leaf blade epidermis, presence of round or oval (or potato-shaped) silica bodies>/
1. with round to oval silica bodies <Figs 162, 178, 183>/
 2. without <significant numbers of> round to oval silica bodies/
- #296. Costal regions <of the abaxial leaf blade epidermis, presence of horizontally elongated-smooth silica bodies>/
1. with elongated-smooth silica bodies <Fig. 163>/
 2. without <significant numbers of> elongated-smooth silica bodies/
- #297. Stomata <abaxial, presence in the abaxial leaf blade epidermis>/
1. absent or very rare <Fig. 183>/
 2. common <abaxially>/
- #298. Stomata <of the abaxial leaf blade, end to end guard cell length: for species sample, see attached list>/
- microns long/
- #299. Stomata <of the abaxial leaf blade, guard-cells overlapped or overlapping (Watson & Johnston 1978: *Aust. J. Bot.* 26)>/
1. having guard-cells overlapped by the interstomatal <Plate 3:20; Figs 166, 167>/
 2. having guard-cells overlapping to flush with the interstomatal <Plate 3:21; Figs 165, 167>/
- #300. Stomata <abaxial leaf blade, presence/abundance of triangular subsidiaries>/
1. without triangular subsidiaries/
 2. <commonly> with triangular subsidiaries <Plates 3:21, 3:22; Figs 139, 143, 147, 150, 152, 153, 160, 165, 168, 169, 171, 173, 174, 177, 178, 179>/
- #301. Stomata <abaxial leaf blade, presence/abundance of parallel-sided subsidiaries>/
1. without parallel-sided subsidiaries/
 2. <commonly> with parallel-sided subsidiaries <Plate 3:20; Figs 144, 146, 156, 166>/
- #302. Stomata <abaxial leaf blade, whether exhibiting a mixture of parallel-sided and triangular subsidiaries on the same leaf>/
1. exhibiting on the same leaf a mixture of stomatal complexes with triangular and parallel-sided subsidiaries/
 2. not exhibiting parallel-sided and triangular subsidiaries on the same leaf/
- #303. Intercostal short-cells <abaxial leaf blade, presence/abundance — prickles and hair bases not regarded as short-cells>/
1. common <Figs 147, 149, 150, 152, 164, 169, 171–173, 175, 176, 179, 180, 183, 184, 186>/
 2. absent or very rare <Figs 144, 148>/
- #304. Intercostal short-cells <abaxial leaf blade epidermal, arrangement>/
1. in cork/silica-cell pairs <Figs 152, 171–173, 175, 176, 180, 183, 184>/
 2. not paired <note that some short-cells recorded as 'solitary' probably represent superposed cork/silica-cell pairs> <Figs 152, 169, 179, 184>/
- #305. Intercostal short-cells <abaxial leaf blade epidermal, whether silicified>/
1. silicified <Figs 152, 171–173, 175, 176, 179, 180, 183>/

2. not silicified <Figs 152, 169, 184>/
- #306. Costal short-cells <abaxial leaf blade epidermal, arrangement of short-cells; prickles, hair bases not counted as short-cells>/
 1. conspicuously in long rows <of five or more cells> <Plates 3:19, 3:21, 3:22; Figs 140, 141, 143, 145, 146, 150–153, 156, 158, 160, 161, 164, 169, 171–175, 177, 180, 182, 184–186>/
 2. predominantly paired <Figs 159, 170, 178>/
 3. neither distinctly grouped into long rows nor predominantly paired <solitary; in short rows, mixtures of solitaires, pairs, short rows, etc.> <Figs 147, 148, 157, 162, 163, 176, 181>/

Transverse section of leaf blade, physiology, culm anatomy.

- #307. <Maximum cells-distant count; indicating photosynthetic pathway; see Hattersley & Watson 1975: *Phytomorphology* 25>/
 1. <showing a maximum cells-distant count of one, reliably predicting> C₄ <Plates 3:23, 3:24; Figs 187, 188, 192–196, 198, 207–213, 222, 224–226>/
 2. <showing a maximum cells-distant count of two or more, reliably predicting> C₃ <Plates 3:25, 3:26; Figs 189–191, 197, 216, 218, 219, 223, 227>/
 - #308. The <C<sub>4
 - 1. conventional <to become implicit> <Plates 3:23, 3:24; Figs 187–188, 192–196, 210, 212, 222>/
 - 2. unconventional <Figs 198, 208–209, 211, 213>/</sub>
- #309. Organization of <leaf blade> PCR tissue <when unconventional>/
 1. *Triodia* type <with the PCR cells forming a layer draping (at least in places) from one bundle to the next, rather than constituting discrete bundle sheaths> <Figs 198, 213>/
 2. *Alloteropsis* type <with two bundle sheaths, the inner being PCR> <Figs 208, 209>/
 3. *Aristida* type <the PCR cells constituting a double bundle sheath>/
 4. *Arundinella* type <with single PCR files or groups in the mesophyll, in addition to the conventional PCR sheath> <Fig. 211>/
- #310. <C₄> biochemical type <as determined by enzyme assay: data from Hatch and Kagawa 1974, Gutierrez et al. 1974(a) and 1974(b), Hatch, Kagawa and Craig 1975, and Prendergast, Hattersley and Stone 1987. Species samples in parentheses>/
 1. PCK/
 2. NAD-ME/
 3. NADP-ME/
- #311. <Leaf blade XyMS: reliably indicative of C₄ type (Hattersley & Watson 1976: *Aust. J. Bot.* 24, N.B., ascertainable from major vascular bundles only)>/
 1. XyMS+ <C₃, or C₄ 'aspartate formers' type PCK or NAD-ME (exceptions: *Eriachneae*)> <Plates 3:24–26; Figs 187, 189–193, 195–198, 203–205, 212, 214, 220, 223, 224>/
 2. XyMS– <C₄ 'malate formers', type NADP-ME> <Plate 3:23; Figs 188, 199, 208, 209, 222>/
- #312. <Leaf blade> PCR sheath outlines <in C₄ forms> <data extensively from Ellis 1977, and Prendergast and Hattersley 1987>/
 1. uneven <PCK or 'PCK-like', Figs 187, 193–195, 207, 210>/
 2. even <NAD-ME or 'NAD-ME-like', IFigs 188, 192, 196, 212>/
- #313. <Leaf blade> PCR sheath extensions <presence> <data mainly from H.D.V. Prendergast 1987>/
 1. present <in at least some veins> <Figs 187, 193, 207>/
 2. absent <Figs 194–196>/
- #314. Maximum number of <leaf blade PCR sheath> extension cells <data mainly from H.D.V. Prendergast 1987>/
- #315. <Leaf blade> PCR cells <of C₄ forms, presence of a suberised lamella> <cf. Hattersley and Browning 1981>/
 1. with a suberised lamella <Figs 199–203>/
 2. without a suberised lamella <Figs 204–206>/
- #316. <Leaf blade> PCR cell chloroplasts <of C₄ forms, shape> <data from H.D.V. Prendergast 1987, Prendergast, Hattersley and Stone 1987>/
 1. ovoid <Figs 193, 195>/
 2. elongated <Figs 194, 196, 205, 206>/
- #317. <Leaf blade> PCR cell chloroplasts <of C₄ forms, whether granal. See Gutierrez et al. (1974), Carolin et al. (1973), Hattersley and Browning (1981)>/
 1. with well developed grana <Figs 204–206>/
 2. with reduced grana <Figs 199–203>/
- #318. <Leaf blade> PCR cell chloroplasts <position. Data extensively from Ellis 1977, Brown 1960, Prendergast and Hattersley 1987>/
 1. centrifugal/peripheral <sometimes NAD-ME, more often indicative of NADP-ME or PCK> <Plate 3:23; Figs 193, 195, 199, 201–203>/
 2. centripetal <NAD-ME: predominant in arid and semiarid species> <Figs 192, 194, 196, 204–206>/
- #319. <Leaf blade> PBS cells <of C₃ forms>/
 1. with a suberised lamella/
 2. without a suberised lamella/
- #320. Leaf blade chlorophyll *a:b* ratio <data from Prendergast 1987>/
- #321. <Leaf blade> mesophyll <whether chlorenchyma radiate: an ill-defined feature, not reliably indicative of photosynthetic pathway>/
 1. with radiate chlorenchyma <Plates 3:23, 3:24, 3:26; Figs 187, 192, 195–197, 207–210 etc.>/
 2. with non-radiate chlorenchyma <Plate 3:25; Figs 189–191, 213 etc.>/
- #322. <Leaf blade> mesophyll <presence of palisade>/
 1. with <a clear> adaxial palisade <Figs 214, 216>/
 2. without <any obvious> adaxial palisade/
- #323. <Leaf blade> mesophyll <presence of *Isachne*-type mesophyll>/
 1. *Isachne*-type <Plate 3:26; Fig. 197>/
 2. not *Isachne*-type/
- #324. <Leaf blade> mesophyll <presence of 'circular cells' (i.e. isolated PCR cells or cell groups; 'distinctive cells')>/
 1. exhibiting 'circular cells' <Fig. 211>/
 2. without 'circular cells'/
- #325. <Leaf blade> mesophyll <whether traversed by (at least some) columns of colourless cells>/
 1. traversed by columns of colourless cells <Plate 3:24; Figs 192, 210>/
 2. not traversed by colourless columns <Figs 187, 188, 193, 212, 224, 225 etc.>/
- #326. <Leaf blade> mesophyll <presence of arm cells (= 'ratchet' cells)>/
 1. with arm cells <Figs 213, 215, 216>/
 2. without arm cells/
- #327. <Leaf blade> mesophyll <presence of fusoid cells>/
 1. with fusoids <Figs 214, 216–220>/
 2. without fusoids/
- #328. The fusoids <whether part of the PBS>/
 1. an integral part of the PBS <Fig. 219>/
 2. external to <though contiguous with> the PBS <Figs 214–216, 218>/
- #329. Leaf blade <ribbing>/
 1. with distinct, prominent adaxial ribs <only> <Figs 187, 189, 190, 227, 228>/
 2. 'nodular' in section <Plate 3:26; Fig. 191>/
 3. adaxially <more or less> flat <ignore mid-rib. Includes forms with abaxial ribs only> <Plates 3:23, 3:24; Figs 212, 224, 226>/
- #330. Leaf blade <adaxial ribs, relative sizes>/
 1. with the ribs more or less constant in size <Fig. 187>/
 2. with the ribs very irregular in sizes <i.e. of two or more size orders; ignore the mid-rib> <Figs 189, 190, 227>/
- #331. Midrib <of the leaf blade, prominence>/
 1. conspicuous <prominent in the outline, with distinctive sclerenchyma, etc.> <Plate 3:25; Figs 221, 222>/
 2. not readily distinguishable from other main veins <other than by position>/
- #332. Midrib <of the mid leaf blade, vascularization>/
 1. with one bundle only/
 2. with a conventional arc of bundles <i.e. at least three bundles> <Fig. 222>/
 3. vascularization complex <i.e. more than one bundle, not arranged in a conventional arc> <Fig. 221>/
- #333. Midrib <and/or middle part of leaf blade, whether extensively of colourless cells adaxially>/
 1. with <conspicuous> colourless tissue adaxially <Fig. 222>/
 2. without <conspicuous> colourless tissue adaxially/

- #334. The lamina <in transverse section, symmetry around the midrib>/
1. distinctly asymmetrical on either side of the midrib <usually involving marked asymmetry in the ribbing and/or the form of the margin; e.g. as in many bamboos>/
 2. symmetrical on either side of the midrib/
- #335. <Presence in the adaxial leaf blade of discrete adaxial groups of bulliforms; exclude 'hinges' flanking midribs>/
1. bulliforms present in discrete, regular adaxial groups <Plates 3:23, 3:24; Figs 187, 188, 191–197, 207, 208, 210, 212, 216, 221, 223–225>/
 2. no discrete, regular groups of adaxial bulliforms <absent, exclusively in irregular groups or constituting most of the epidermis> <Plate 3:25; Figs 189, 219, 226>/
- #336. <Presence in the adaxial leaf blade of simple fan-shaped bulliform groups>/
1. bulliforms occurring in simple fan-shaped groups <i.e. without associated colourless cells> <Figs 187, 190, 191, 196, 197, 207, 209, 216, 220, 223>/
 2. without simple fans of bulliforms <ignore midrib 'hinges'>/
- #337. <Presence in the adaxial leaf blade of deeply-penetrating fans of combined colourless cells> <Figs 187, 190, 191, 196, 197, 207, 209, 216, 220, 223>/
1. having <at least some> bulliforms combined with colourless cells to form deeply-penetrating fan-shaped groups <Plate 3:24; Figs 187, 192, 210, 212>/
 2. without deeply-penetrating fans of bulliforms-plus-colourless cells/
- #338. <Presence in the adaxial leaf blade of narrow groups of bulliforms-plus-colourless cells>/
1. having <at least some> bulliforms associated with colourless cells to form narrow groups penetrating into the mesophyll <Fig. 224>/
 2. without narrow-penetrating groups of bulliforms-plus-colourless cells/
- #339. <Whether bulliforms and associated colourless cells form arches in the leaf blade>/
1. bulliforms and associated colourless cells <sometimes> forming arches over small vascular bundles <Figs 188, 225>/
 2. without bulliform-plus-colourless cell arches/
- #340. <Presence in the leaf blade of small vascular bundles unaccompanied by sclerenchyma>/
1. many of the smallest vascular bundles unaccompanied by sclerenchyma <Plate 3:23; Figs 222, 226>/
 2. all <or nearly all> the vascular bundles accompanied by sclerenchyma/
- #341. <Presence in the leaf blade of vascular bundles combining both adaxial and abaxial girders>/
1. exhibiting vascular bundles <at least some, if only the midrib> combining both adaxial and abaxial girders of sclerenchyma <Plate 3:24, 3:25; Figs 187–195, 197, 212, 216, 220, 223–225, 227>/
 2. without vascular bundles combining adaxial with abaxial girders of sclerenchyma <cf. Figs 194, 208, 209>/
- #342. The combined girders <adaxial and abaxial sclerenchyma girders, whether forming 'anchors', I's or T's in one or more bundles of the leaf blade (include the midrib)>/
1. forming 'figures' <'anchors', I's or T's> <in at least some bundles> <Plate 3:24; Figs 187–193, 195, 212, 216, 223, 227>/
 2. nowhere forming 'figures' <i.e. no 'anchors', I's or T's>/
- #343. Sclerenchyma <whether all leaf blade sclerenchyma is bundle-associated>/
1. all associated with vascular bundles <apart from any marginal fibres>/
 2. not all <obviously> bundle-associated <Plate 3:25; Fig. 227>/
- #344. Culm internode bundles <arrangement; poorly recorded, data mainly from Metcalfe 1960>/
1. in one or two rings <ignore 'outer rings' of very few bundles>/
 2. in three or more rings/
 3. scattered/
- #345. Stem tissues of the culm bases <whether accumulating abundant starch: data from Smith 1968, Smouter and Simpson 1989 and original observations>/
1. with abundant starch/
 2. with little or no starch <implying fructans and/or sucrose>/
- #346. Fructosans predominantly <short- or long-chain>/
1. short-chain/
 2. long-chain/
- Special diagnostic features.**
- #347. <*Anomochloa*>/
1. inflorescence of 2–3 glumeless, bracteate spikelets, the lodicules represented by a fringed annulus/
 2. plant not as in *Anomochloa* <implicit>/
- #348. <*Arundo*/*Phragmites*>/
1. female-fertile lemmas conspicuously hairy; ligule hairs to 0.3 mm long, shorter than the membrane/
 2. female-fertile lemmas hairless; ligule hairs longer than 0.5 mm, longer than the membrane/
- #349. <*Atractantha*>/
1. the inflorescences of very peculiar pseudospikelets, characterized by development of rachides with long terminal segments, each of which serves as the pedicel of an abscissile spikelet/
 2. the inflorescences not as in *Atractantha* <implicit>/
- #350. <*Briza*>/
1. lemmas as broad as long, gibbous and umbonate, cordate at base <*Briza*> <Fig. 88>/
 2. lemmas not as in *Briza* <implicit>/
- #351. <*Brylkinia*>/
1. lemma awn winged, the wing extending down the upper back of the lemma/
 2. lemma not wing-awned <implicit>/
- #352. <*Buchloe*>/
1. the male inflorescences elevated, with one to four spicate, unilateral branches; female spikelets in burr-like clusters, usually two burrs per inflorescence, each burr on a short, stout rachis, partially enclosed in a broad, bractlike leaf sheath, falling entire with the indurate rachis united with the upper glumes/
 2. not as in *Buchloe* <implicit>/
- #353. <*Centrochloa*>/
1. upper glume extended downwards into a conspicuous spur/
 2. upper glume not as in *Centrochloa* <implicit>/
- #354. <*Chaetobromus*>/
1. pedicels articulated and bearded with long hairs at and above the joint/
 2. pedicels not as in *Chaetobromus*/
- #355. <*Coix*>/
1. inflorescences in hard, globular 6–12 mm utricles/
 2. inflorescences not as in *Coix* <implicit>/
- #356. <*Cortaderia*/*Lamprothyrus*>/
1. the lemma awns lateral and median, the median strongly flattened/
 2. the median lemma awn not strongly flattened, laterals present or absent/
- #357. <*Corynephorus*>/
1. lemmas awned, the awn bearing a ring of minute hairs at the middle, and apically clavate <Fig. 93>/
 2. lemmas without the characteristic *Corynephorus* awn <implicit>/
- #358. <*Cyperochloa*>/
1. the inflorescence of a few digitately-borne, bracteate spikelets, subtended by a spatulate leaf atop a single elongated culm internode, the plant very sedge-like in appearance/
 2. plants not as in *Cyperochloa* <implicit>/
- #359. <*Diandrostachya*>/
1. the lower glume exceeding the female-fertile lemma/
 2. the lower glume shorter than the female-fertile lemma/
- #360. <*Diarrhena*>/
1. grain with a conspicuous whitish or yellowish, glossy beak/
 2. fruit not as in *Diarrhena* <implicit>/
- #361. <*Dichanthelium*>/
1. plants from a short rosette of winter leaves, the primary panicle producing secondary inflorescences with cleistogamous spikelets/
 2. plants not as in *Dichanthelium*/
- #362. <*Enneapogon*/*Schmidtia*> /<*Cottea*/*Kaokochloa*>/
1. female-fertile lemmas 9-lobed, each lobe terminating in an awn/

2. female-fertile lemmas 6-lobed and 5-awned, with an awn arising between each pair of lobes/
 3. female-fertile lemmas irregularly lobed, the lobes produced into 7-11 awns/
 4. female-fertile lemmas with an incurved-emarginate apex, and a narrow awned lobe at each margin (sometimes with 1-2 shorter, additional lobes)/
- #363. <*Eriochloa*>/
1. spikelets supported on a peculiar, hardened, cupuliform 'callus' <Plate 2:16>/
 2. no *Eriochloa*-type 'callus' <implicit>/
- #364. <*Hackelochloa*/*Hemarthria*/*Rotboellia*>/
1. lower glume of female-fertile spikelet globose, pitted/
 2. lower glume of female-fertile spikelet flattish, not pitted; 'pedicellate' spikelets similar to the female-fertile spikelets/
 3. lower glume of female-fertile spikelet flattish, not pitted; 'pedicellate' spikelets reduced, herbaceous/
- #365. <*Hubbardia*>/
1. plants of wet places, the leaves remarkably thin and delicate/
 2. plants not as in *Hubbardia* <implicit>/
- #366. <*Hydrothauma*>/
1. the adaxial surface of the leaf blade raised into sinuous lamellae/
 2. the adaxial surface of the leaf blade not as in *Hydrothauma*/
- #367. <*Hygroryza*>/
1. plants aquatic, with inflated leaf sheaths serving as floats/
 2. plants not as in *Hygroryza* <implicit>/
- #368. <*Koeleria*/*Trisetum*>/
1. panicle dense, cylindrical, ovoid, not interrupted: awns if present straight, subterminal, inconspicuous in the inflorescence/
 2. panicle loose, or if dense then interrupted, neither cylindrical nor ovoid: awns usually present, usually twisted, usually distinctly dorsal, conspicuous if inflorescence compact/
- #369. <*Leptaspis* and *Scrotochloa*>/
1. having female spikelets, with shell- or urn-shaped lemmas which are closed save for an apical pore/
 2. not having female spikelets as in *Leptaspis* or *Scrotochloa* <implicit>/
- #370. <*Lombardochloa*>/
1. female-fertile lemma very broad, with a conspicuous, succulent, translucent region near the base of each wing/
 2. female-fertile lemma not as in *Lombardochloa* <implicit>/
- #371. <*Lopholepis*>/
1. spikelets minute, shaped like cartoon birds' heads/
 2. spikelets not as in *Lopholepis* <implicit>/
- #372. <*Lygeum*>/
1. plant coarsely tufted, with wiry leaf blades, the inflorescence of one very peculiar spikelet enclosed in a sheath/
 2. plant and inflorescence not as in *Lygeum* <implicit>/
- #373. <*Manisuris*>/
1. spikelets in 'false pairs', the pedicellate member of the andropogonoid pair abscinding from its pedicel but remaining attached to the base of the 'article' above, alongside the sessile member of that 'article'/
 2. spikelets not arranged as in *Manisuris* <implicit>/
- #374. <*Melica* et al.>/
1. spikelets with the distal incomplete florets and/or the rachilla apex forming a terminal clavate appendage/
 2. spikelets without a terminal clavate appendage <implicit>/
- #375. <*Merxmüllera*/*Karroochloa*/*Chaetobromus*/*Schismus*>/
1. female-fertile lemmas with a bent awn, the awn twisted below/
 2. female-fertile lemmas awnless, mucronate or with a short straight awn/
- #376. <*Merxmüllera*/*Karroochloa*>/
1. spikelets 8-25 mm long, inflorescence longer than 60 mm long/
 2. spikelets 4-6(-7) mm long, inflorescence 10-60 mm long/
- #377. <*Nassella*>/
1. spikelet with a single gibbous floret, the lemma awn placed off-centre/
 2. spikelet not as in *Nassella* <implicit>/
- #378. <*Odontelytrum*>/
1. the inflorescence a coarse, cylindrical 'raceme', apparently representing a raceme of reduced 'glomerules', each glomerule shortly pedunculate, comprising a single spikelet subtended crosswise by a lobed scale forming an involucre-plus-bristle/
 2. the inflorescence not as in *Odontelytrum* <implicit>/
- #379. <*Paspalum*/*Echinochloa*/*Paspalidium*>/
1. glumes and/or sterile lemmas awned or acuminate-mucronate/
 2. spikelets awnless, muticous/
 3. spikelets awnless, the female-fertile lemmas pointed or apiculate but not mucronate/
- #380. <*Phaenosperma*>/
1. seed dark brown, with ruminate endosperm/
 2. seed not as in *Phaenosperma* <implicit>/
- #381. <*Phyllorhachis*>/
1. spikelets borne on one side of a broad, leaflike rachis/
 2. spikelets not borne on a broad, leaflike rachis <implicit>/
- #382. <*Prosphytochloa*>/
1. scandent via leaf blades with retrorsely scabrid margins/
 2. not scandent as in *Prosphytochloa* <implicit>/
- #383. <*Rhynchoryza*>/
1. female-fertile lemma with its tip extended beyond the palea as a conical, herbaceous beak (flotation device) composed of aerenchyma with transverse septa, tapering into an awn/
 2. female-fertile lemma not as in *Rhynchoryza*/
- #384. <*Sorghastrum*/*Sorghum*>/
1. spikelets ostensibly solitary, each accompanied by a barren pedicel/
 2. spikelets paired, all the pedicels spikelet-bearing/
- #385. <*Spartochloa*, *Xerochloa*>/
1. rush-like, with reduced leaf blades/
 2. not rush-like <implicit>/
- #386. <*Spinifex*>/
1. female inflorescence a large, deciduous globular head of sessile, bristle-tipped racemes <Fig. 26>/
 2. inflorescence not as in *Spinifex* <implicit>/
- #387. <*Steyermarkochloa*>/
1. culms dimorphic, the fertile culms leafless, the vegetative culms each with a single developed leaf, this being eligulate and with a terete, culm-like 'sheath'/
 2. plants not as in *Steyermarkochloa* <implicit>/
- #388. <*Thuarea*>/
1. flowering culms ultimately bending over, so as to enclose the ripening fruit/
 2. flowering culms not as in *Thuarea* <implicit>/
- #389. <*Thyridolepis*>/
1. lower glume <of female-fertile spikelet> with a rectangular window, surmounted by bristles <Fig. 70>/
 2. without a *Thyridolepis*-type window <implicit>/
- #390. <*Urelytrum*>/
1. the lower glume of the pedicellate spikelet with a 5-10 mm (or longer) awn/
 2. the lower glume of the pedicellate spikelet awnless/
- #391. <*Viguierella*>/
1. the inflorescence a spicate 'raceme', with each spikelet subtended at its base by a tiny hyaline bract: Madagascar/
 2. not *Viguierella* <implicit>/
- #392. <*Zea*>/
1. fruiting inflorescence a massive, spatheate cob, the fruits in many rows/
 2. fruiting inflorescence not as in *Zea* <implicit>/
- #393. <*Zygochloa*>/
1. stems cane-like, spikelets in bracteate, globular 1-3.5 cm heads/
 2. plants not as in *Zygochloa* <implicit>/

Cytology.

- #394. Chromosome base number, $x =$ /
- #395. <Diploid chromosome numbers> $2n =$ /
- #396. <Recorded ploidy levels: data very incomplete>/
- ploidy/
- #397. Mean diploid $2c$ DNA value <range and number of species studied in parenthesis: data mainly from Bennett and Smith (1976) and Bennett, Smith and Heslop-Harrison (1982)>/

Taxonomy.

- #398. <Subfamily: Watson *et al.* 1985>/
1. Pooideae/
 2. Bambusoideae/
 3. Arundinoideae/
 4. Chloridoideae/
 5. Panicoideae/
- #399. <Supertribes of Watson *et al.* 1985, with name endings changed>/
1. Triticoideae/
 2. Poodae/
 3. Oryzodeae/
 4. Bambusodeae/
 5. Panicodeae/
 6. Andropogonodeae/
- #400. <Tribe of Pooideae>/
1. Triticeae/
 2. Brachypodieae/
 3. Bromaeae/
 4. Aveneae <including Agrostideae, Phalarideae>/
 5. Meliceae/
 6. Seslerieae/
 7. Poeae <including Hainardieae, Monermeae>/
- #401. <Tribe of Bambusoideae>/
1. Oryzeae/
 2. Olyreae/
 3. Centothecaeae/
 4. Anomochloaeae/
 5. Brachyelytreae/
 6. Diarrheneae/
 7. Ehrharteae/
 8. Phaenosperrmateae/
 9. Phyllorhachideae/
 10. Phareae/
 11. Streptochaeteae/
 12. Streptogyneae/
 13. Guaduellieae/
 14. Puelieae/
 15. Bambuseae/
- #402. <Tribe of Arundinoideae>/
1. Stipeae/
 2. Nardeae/
 3. Lygeae/
 4. Arundineae/
 5. Danthonieae <and satellites>/
 6. Micraireae/
 7. Aristideae/
 8. Eriachneae/
 9. Steyermarkochloaeae/
 10. Spartochloaeae/
 11. Cyperochloaeae/
- #403. <Tribe of Chloridoideae>/
1. Triodieae/
 2. Pappophoreae/
 3. Orcuttieae/
 4. Chlorideae *sensu lato* <the main chloridoid assemblage, including Cynodonteae, Eragrostae, Sporoboleae, Aeluropodeae, Jouveae, Unioleae, Leptureae, Lappagineae, Spartineae, Trageae, Perotideae, Pommeruella>/
- #404. <Tribe of Panicoideae>/
1. Isachneae/
 2. Paniceae/
 3. Neurachneae/
 4. Arundinelleae/
 5. Andropogoneae/
 6. Maydeae/
- #405. <Subtribe of Andropogoneae>/
1. Andropogoninae <'awned Andropogoneae'>/
 2. Rottboellinae <'awnless Andropogoneae'>/
- #406. 'Nearest neighbours' <in ascending order of 'distance', according to DIST calculations conducted in 1985. Note that these are safely interpretable as 'closest taxonomic relatives' only when reciprocal lists are in agreement. The misleading appearance of the same large genera (*Poa*, etc.) in many lists probably reflects their internal variability>/

Ecology, geography, regional floristic distribution.

- #407. <Number of species>/
- species/
- #408. <Geographic distribution>/

- #409. <World distribution: this 'character' is intended only for convenience in key-making — for more precise distributions, see 'geographical distribution'>/
1. Western Eurasia, U.S.S.R. <includes Iran, Iraq, Turkey>/
 2. Mediterranean/
 3. Eastern Asia <Japan, China to India>/
 4. Africa <and Saudi Arabia>/
 5. Pacific <Malaysia, Indonesia, Australasia, Pacific Islands>/
 6. North America <Canada, Alaska, U.S.A., Mexico>/
 7. South and Central America, West Indies/
 8. Arctic/
- #410. <Whether commonly adventive on an intercontinental scale>/
1. commonly adventive/
 2. not commonly adventive <implicit>/
- #411. <Habitat water requirement>/
1. hydrophytic/
 2. helophytic <i.e., in marshy places>/
 3. mesophytic/
 4. xerophytic/
- #412. <Habitat light requirement>/
1. shade species/
 2. species of open habitats/
- #413. <Salt tolerance, etc.>/
1. halophytic/
 2. glycophytic <= not halophytic>/
- #414. <Habitat notes: soil types, etc.>/
- #415. <Geographical occurrence in Australasia — mainly after Simon 1978>/
1. Tasmania/
 2. New South Wales/
 3. Australian Capital Territory/
 4. Victoria/
 5. Western Australia/
 6. Queensland/
 7. Northern Territory/
 8. South Australia/
 9. New Guinea/
 10. New Zealand/
 11. not known in Australasia <implicit>/
- #416. <Geographical distribution in southern Africa>/
1. Namibia/
 2. Botswana/
 3. Transvaal/
 4. Orange Free State/
 5. Swaziland/
 6. Natal/
 7. Lesotho/
 8. Cape Province/
 9. not in southern Africa <implicit>/
- #417. <Status in southern Africa>/
1. indigenous species/
 2. naturalized species <in southern Africa>/
 3. cultivated/
- #418. <Geographical distribution in North America>/
- #419. <Number of species in the Flora North America region: data from Kartesz and Kartesz 1980>/
- species in North America/
- #420. <Status in North America: Flora North America region>/
1. indigenous species/
 2. naturalized species <in North America>/
 3. cultivated/
- #421. <Floristic Kingdoms: after Takhtajan 1969. Data deduced from information for Takhtajan's floristic regions (see below), provided by B. K. Simon 1987>/
1. Holarctic/
 2. Palearctic/
 3. Neotropical/
 4. Cape/
 5. Australian/
 6. Antarctic/
- #422. <Holarctic Subkingdoms: after Takhtajan 1969>/
1. Boreal/
 2. Tethyan <ancient Mediterranean>/
 3. Madrean <Sonoran>/
- #423. <Palearctic Subkingdoms: after Takhtajan 1969>/
1. African/
 2. Madagascan/
 3. Indomalasian/
 4. Polynesian/
 5. Neocaledonian/

- #424. <Boreal Subkingdom regions: after Takhtajan 1969>/
 1. Arctic and Subarctic/
 2. Euro-Siberian/
 3. Eastern Asian/
 4. Atlantic North American/
 5. Rocky Mountains/
- #425. <Tethyan Subkingdom regions: after Takhtajan 1969>/
 1. Macaronesian/
 2. Mediterranean/
 3. Irano-Turanian/
- #426. <African Subkingdom regions: after Takhtajan 1969>/
 1. Saharo-Sindian/
 2. Sudano-Angolan/
 3. West African Rainforest/
 4. Namib-Karoo/
 5. Ascension and St. Helena/
- #427. <Indomalesian Subkingdom regions: after Takhtajan 1969>/
 1. Indian/
 2. Indo-Chinese/
 3. Malesian <Malayan>/
 4. Papuan/
- #428. <Polynesian Subkingdom regions: after Takhtajan 1969>/
 1. Hawaiian/
 2. Polynesian/
 3. Fijian/
- #429. <Neotropical regions: after Takhtajan 1969>/
 1. Caribbean/
 2. Venezuela and Surinam/
 3. Amazon/
 4. Central Brazilian/
 5. Pampas/
 6. Andean/
 7. Fernandezian/
- #430. <Australian regions: after Takhtajan 1969>/
 1. North and East Australian/
 2. South-West Australian/
 3. Central Australian/
- #431. <Antarctic regions: after Takhtajan 1969>/
 1. New Zealand/
 2. Patagonian/
 3. Antarctic and Subantarctic/
- #432. <Euro-Siberian Subregions>/
 1. European/
 2. Siberian/
- #433. <Atlantic North American Subregions>/
 1. Canadian-Appalachian/
 2. Southern Atlantic North American/
 3. Central Grasslands/
- #434. <Sudano-Angolan Subregions>/
 1. Sahelo-Sudanian/
 2. Somali-Ethiopian/
 3. South Tropical African/
 4. Kalaharian/
- #435. <North and East Australian Subregions>/
 1. Tropical North and East Australian/
 2. Temperate and South-Eastern Australian/
- #436. <Antarctic and Subantarctic Subregions>/
 1. South Temperate Oceanic Islands/
 2. Antarctic/
- Hybrids.**
- #437. <Intergeneric hybrids>/
- Rusts and smuts.**
- #438. Rusts — <genera: data from Cummins 1971, his classification amended by D.B.O. Savile (pers. comm.). Updating beyond Cummins confined as yet to grass nomenclature. Unnamed species of *Agropyron*, *Elymus*, *Panicum* etc. ignored>/
 1. *Dasturella*/
 2. *Phakopsora*/
 3. *Physopella*/
 4. *Stereostromum*/
 5. *Puccinia* <including *Uromyces*>/
 6. no rusts recorded <by Cummins 1971>/
- #439. The *Puccinia* species from <morphological Group — after Cummins 1971, amended by D.B.O. Savile (pers. comm.)>/
 1. Group 1/
 2. Group 2/
 3. Group 5/
 4. Group 6/
 5. Group 7/
 6. Group 8/
- #440. The *Puccinia* species from <the Group 1 species, Savile's subgroups>/
 1. subgroup 1(a)/
 2. subgroup 1(b)/
 3. subgroup 1(c)/
 4. subgroup 1(d)/
- #441. The *Puccinia* species from <the Group 2 species, Savile's subgroups>/
 1. subgroup 2(a)/
 2. subgroup 2(b)/
- #442. The *Puccinia* species from <the Group 5 species, Savile's subgroups>/
 1. subgroup 5(a)/
 2. subgroup 5(b)/
 3. subgroup 5(c)/
 4. subgroup 5(d)/
 5. subgroup 5(e)/
 6. subgroup 5(f)/
 7. subgroup 5(g)/
 8. subgroup 5(h)/
 9. subgroup 5(i)/
 10. subgroup 5(j)/
 11. subgroup 5(k)/
- #443. The *Puccinia* species from <the Group 6 species, Savile's subgroups>/
 1. subgroup 6(a)/
 2. subgroup 6(b)/
 3. subgroup 6(c)/
 4. subgroup 6(d)/
 5. subgroup 6(e)/
- #444. Wide-ranging <rust> species: <wide-ranging here = recorded on 3 or more host genera by Cummins (1971)>/
 1. *Dasturella divina*/
 2. *Phakopsora incompleta*/
 3. *Physopella clemensiae*/
 4. *Stereostromum corticoides*/
 5. *Puccinia chaetochloae*/
 6. *Puccinia stenotaphri*/
 7. *Puccinia microspora*/
 8. *Puccinia polysora*/
 9. *Puccinia miscanthae*/
 10. *Puccinia nakanishikii*/
 11. *Puccinia longicornis*/
 12. *Puccinia kusanoi*/
 13. *Puccinia eritreaeensis*/
 14. *Puccinia graminella*/
 15. *Puccinia dolosa*/
 16. *Puccinia orientalis*/
 17. *Puccinia graminis*/
 18. *Puccinia levis*/
 19. *Puccinia substriata*/
 20. '*Uromyces*' *setariae-italicae*/
 21. '*Uromyces*' *schoenanthi*/
 22. *Puccinia emaculata*/
 23. *Puccinia cacabata*/
 24. *Puccinia coronata*/
 25. *Puccinia striiformis*/
 26. *Puccinia montanensis*/
 27. *Puccinia pygmaea*/
 28. *Puccinia brachypodii-phoenicoidis*/
 29. *Puccinia brachypodii*/
 30. *Puccinia praegracilis*/
 31. *Puccinia poarum*/
 32. *Puccinia hordei*/
 33. *Puccinia recondita*/
 34. '*Uromyces*' *turcomanicum*/
 35. '*Uromyces*' *fragilipes*/
 36. '*Uromyces*' *dactylidis*/
 37. '*Uromyces*' *hordeinus*/
 38. *Puccinia monoica*/
 39. *Puccinia versicolor*/
 40. *Puccinia boutelouae*/
 41. *Puccinia chloridis*/
 42. *Puccinia schedonnardi*/
 43. '*Uromyces*' *clignyi*/
 44. '*Uromyces*' *eragrostidis*/
 45. *Puccinia miyoshiana*/
 46. *Puccinia cesatii*/
 47. *Puccinia esclavensis*/
 48. *Puccinia aristidae*/

49. no wide-ranging rust species <i.e. the positive records limited to rusts with restricted host ranges, as given by Cummins 1971: implicit>/
- #445. Smuts <families: data not yet updated from Watson (1972), and *Panicum*, *Danthonia*, *Agropyron*, *Elymus* etc. omitted pending nomenclatural checking of records>/
1. from *Tilletiaceae*/
 2. from *Ustilaginaceae*/
 3. not recorded <implicit: but see qualification>/
- #446. <Smut genera> *Tilletiaceae* —/
1. *Entyloma*/
 2. *Melanotaenium*/
 3. *Neovossia*/
 4. *Tilletia*/
 5. *Urocystis*/
- #447. <Smut genera> *Ustilaginaceae* —/
1. *Sorosporium*/
 2. *Sphacelotheca*/
 3. *Tolyposporella*/
 4. *Tolyposporium*/
 5. *Ustilago*/

Economic importance.

- #448. Significant weed species: <list extended from Häfliger and Scholtz 1980>/
- #449. Cultivated fodder:/
- #450. Important native pasture species:/
- #451. Grain crop species:/
- #452. Lawns and/or playing fields:/
- #453. Commercial essential oils:/
- #454. <Miscellaneous economic/ethnic data> <little yet entered>/

References, etc.

- #455. Morphological/taxonomic references: <articles of special interest listed here have only rarely provided most of the morphological descriptive data. The latter reflect compilations from the separately listed 'main sources', plus original observations by Watson and associates (notably S.G. Aiken, H.T. Clifford, C.R. Frylink, G.E. Gibbs Russell and T.D. Macfarlane)>/
- #456. Leaf anatomical references: <'original observations' by Watson, or for Pooidae from Macfarlane 1979 supplemented by Watson. Note the need to account for taxonomic realignments (especially in *Triticeae*) when using Metcalfe 1960>/

Special comments.

- #457. <Special comments>/

Additional characters under consideration.

- #458. Plants <diameter>/
- cm in diameter/
- #459. Culms <number of aerial nodes>/
- noded/
- #460. Culms <habit>/
1. self-supporting <implicit>/
 2. decumbent/
 3. scrambling/
 4. scandent/
 5. pendent/
 6. floating/
- #461. Culm leaves <presence>/
1. present/
 2. absent/

- #462. Upper culm leaf blades/
1. fully developed/
 2. reduced/
 3. vestigial <i.e. leaves reduced to sheaths — not to be confused with blade *abscission*>/
- #463. Culm nodes <exposure>/
1. exposed/
 2. hidden by leaf sheaths/
- #464. The <distal> incomplete florets <number>/
- #465. Awn <of female-fertile lemmas, when non-geniculate, shape>/
1. straight/
 2. recurving/
 3. flexuous/
- #466. Awn bases <of female-fertile lemmas, whether twisted>/
1. twisted/
 2. not twisted/
- #467. Awn bases <of female-fertile lemmas, whether flattened>/
1. flattened/
 2. not flattened/
- #468. Palea back <indumentum>/
1. glabrous/
 2. scabrous/
 3. hairy/
- #469. Styles <fusion>/
1. completely fused/
 2. joined below/
 3. free/
- #470. Style bases <degree of separation>/
1. adjacent/
 2. widely separated/
- #471. Fruit <indumentum>/
1. glabrous/
 2. scabrous/
 3. hairy/
- #472. <Fruit colour>/
- #473. Fruiting lemma <of *Paniceae*, colour of mature L2: data from Webster 1986>/
1. white/
 2. yellow/
 3. brown/
 4. black/
- #474. <*Cornucopiae*>/
1. spikelets in numerous small, compact, short-branched panicles, each panicle at the tip of a stout, recurved peduncle and enclosed by a leathery, toothed involucre, the peduncles themselves subtended by the inflated sheaths of the (modified) upper leaves/
 2. spikelets not borne as in *Cornucopiae*/
- #475. Haploid nuclear DNA content <2c value divided by ploidy: ranges and means>/
- pg/
- #476. The 'extra' sclerenchyma <location of leaf blade sclerenchyma not associated with vascular bundles — exclusive of any in the midrib>/
1. in abaxial groups/
 2. in a continuous abaxial layer/
 3. within the mesophyll/
 4. in adaxial groups/
- #477. The 'extra' sclerenchyma <position of groups within the lamina — exclusive of midrib>/
1. abaxial-hypodermal, the groups isolated <opposite bulliforms and/or furrows>/
 2. abaxial-hypodermal, the groups continuous with colourless columns/
 3. adaxial-hypodermal, contiguous with the bulliforms/
- #478. Awns <of female-fertile lemmas, whether hooked ('uncinate')>/
1. hooked/
 2. not hooked <implicit>/

Southern African grass species

- character list

In contrast to the generic character list above, the following character list for southern African species has been deliberately designed to be as short and simple as possible, in order to fulfil its role as a prototype for the next level of approximation of species data in the Taxon component of PRECIS (Gibbs Russell & Arnold 1989). This character list incorporates the 'common knowledge' characters included as 'type one' data in the ILDIS legume database (ILDIS Coordinating Centre 1986), with the addition of diagnostic characters and voucher specimens as recommended by the 1987 meeting of the Herbarium Curators Working Group.

Obviously, a full-scale character list at species level detailed enough to carry sufficient data to allow classification, key generation and detailed descriptions would require several hundred characters, and data-capture would be the work of years. The copious data held in text characters for distinguishing between species and for habitat information will provide a firm basis for development of a complete species-level character list. Expansion to full-scale automated descriptions in DELTA will be an important next step in the study of grasses in southern Africa.

- #1. References. <genera only>/
- #2. <Synonyms>/
- #3. <Vernacular names>/
- #4. <Life form, following Raunkiaer 1936>/
 1. tree or large shrub <phanerophyte>/
 2. shrub or dwarf shrub <chamaephyte>/
 3. perennial <herb - hemicryptophyte>/
 4. bulb or corm <cryptophyte>/
 5. annual <therophyte>/
 6. biennial/
- #5. <Habit>/
 1. epiphyte/
 2. climber/
 3. scrambler/
 4. parasite/
 5. hydrophyte/
 6. <long-> rhizomatous/
 7. stoloniferous/
 8. tufted/
 9. succulent/
 10. <other>/
- #6. <Height of plant in mm>/
mm tall/
- #7. Leaf blades <length>/
mm long/
- #8. Leaf blades <width>/
mm wide/
- #9. Spikelets <length>/
mm long/
- #10. Spikelets <width>/
mm wide/
- #11. <Distinguishing species characters>/
- #12. Flowering <months>/
 1. July <7>/
 2. August <8>/
 3. September <9>/
 4. October <10>/
 5. November <11>/
 6. December <12>/
 7. January <1>/
 8. February <2>/
 9. March <3>/
 10. April <4>/
 11. May <5>/
 12. June <6>/
- #13. <Habitat, e.g., moisture, insolation, substrate, etc.>/
- #14. <Conservation status: - IUCN categories 1986>/
 1. extinct <Ex>/
 2. endangered <E>/
 3. vulnerable <V>/
 4. rare <R>/
 5. conservation status indeterminate <I>/
 6. not endangered <O>/
 7. conservation status not <or insufficiently> known <K>/
- #15. <Abundance, modified from Radford et al. 1974, but rare categories included above in Conservation Status>/
 1. infrequent/
 2. locally common <state area or habitat>/
 3. common <abundant>/
 4. locally dominant <state area or habitat>/
 5. <widely> dominant/
- #16. <Whether indigenous or naturalized>/
 1. indigenous <implicit>/
 2. naturalized/
 3. invader/
- #17. <Area of origin for naturalized taxa>/
- #18. <Distribution - FSA territory>/
 1. Namibia/
 2. Botswana/
 3. Transvaal/
 4. Orange Free State/
 5. Swaziland/
 6. Natal/
 7. Lesotho/
 8. Cape/
 9. Other territories <specify>/
- #19. <Distribution -> biome: <after Rutherford & Westfall 1986>/
 1. Fynbos/
 2. Savanna/
 3. Grassland/
 4. Nama-Karoo/
 5. Succulent Karoo/
 6. Desert/
 7. Forest/
 8. Afromontane/
- #20. <Distribution - outside southern Africa>/
- #21. <Importance to man, after SEPASAL; give details as comment>/
 1. food and drink/
 2. domestic use <e.g., ornaments, utensils and tools>/
 3. timber <including fuel>/
 4. pasture <specify whether planted>/
 5. barrier/
 6. erosion control/
 7. ornamental <specify whether established or potential>/
 8. indicator <specify indicator of what>/
 9. fibers/
 10. poisonous/
 11. medicinal/
 12. traditional medicine/
 13. chemicals/
 14. weed <or other problem plant, or invasive>/
- #22. <Notes and comments>/

#23. <Reference to> description:/

1. Stapf 1898–1900/
2. Hitchcock & Chase 1950/
3. Chippindall 1955/
4. Clayton et al. 1970–1982/
5. Fl. Pl. Afr./
6. <other>/

#24. <Reference to> illustration:/

1. Chippindall 1955/
2. Clayton et al. 1970–1982/
3. Flower. Pl. Afr./
4. Hitchcock & Chase 1950/
5. <other>/

#25. <Reference to map>/

#26. Voucher: <state collector and specimen number>/

#27. PRECIS code/

#28. Species treatment by/

#29. <Divisions of the Cape>/

1. northern/
2. central/
3. eastern/
4. southern/
5. southwestern/
6. northwestern <Namaqualand>/

#30. <Divisions of Namaqualand>/

1. Richtersveld/
2. Namaqualand Rocky Hills/
3. Sandveld/
4. Knersvlakte/

Parameters for generic keys

The keys to genera were produced by the program KEY (Dallwitz 1974, Dallwitz & Paine 1986) from Watson's database of world grass genera. The following are the program parameters for each part of the generic key.

Key to Keys

Characters – 447 in data, 3 included, 3 in key.

Items – 4 in data, 4 included, 4 in key.

RBASE = 1.40, ABASE = 2.00, REUSE = 1.01, VARYWT = .70

Preset characters (character,column:group) - 445,1:1 64,3:1

Characters included - 64 156 445

Character reliabilities - 64,7 156,8 445,9

Key 1.

Characters – 447 in data, 50 included, 4 in key.

Items – 206 in data, 6 included, 6 in key.

RBASE = 1.40, ABASE = 2.00, REUSE = 1.01, VARYWT = .70

Characters included - 3-6 8-49 444-447

Character reliabilities - 3,7 4,6 5-6,7 8-10,7 11,8 12-13,7 14,6 15,5 16-17,7 18,6 19-21,7 22,5 23,7 24,6 25-26,8 27-29,7 30,1 31-36,7 37-38,6 39-43,7 44,1 45-46,7 47-48,4 49,5 444-445,7 446,8 447,7

Items included - 14 17 123 129 142 183

Key 2.

Characters – 447 in data, 261 included, 113 in key.

Items – 206 in data, 87 included, 129 in key.

RBASE = 1.40, ABASE = 2.00, REUSE = 1.01, VARYWT = .70

Preset characters (character,column:group) - 111,4:3 172,5:3 165,7:10 102,8:5 109,8:7 151,8:11 100,9:9

Characters included - 3-6 8-55 61-104 106-244 342 346 348 353 357 363-365 374 376 393-394 397 431-443

Character reliabilities - 3,7 4,6 5-6,7 8-13,7 14,6 15,5 16-17,7 18,6 19-21,7 22,5 23,7 24,5 25-26,8 27-29,7 30,1 31-36,7 37-38,6 39-43,7 44,1 45-46,7 47-48,4 49,5 50,8 51,6 52-55,7 61-64,7 65,6 66-68,7 69,6 70-72,7 73-75,5 76-81,7 82,4 83-88,7 89,6 90-92,7 93,4 94,7 95,5 96,7 97,5 98-104,7 106,1 107-116,7 117,5 118,6 119-142,7 143,8 144-151,7 152,5 153-155,7 156,8 157,7 158,6 159-162,7 163,6 164-165,7 166,5 167,8 168-173,7 174,6 175-177,7 178,5 179-181,7 182,8 183-189,7 190,5 191-193,7 194,6 195-213,7 214-220,4 221,2 222,5 223,4 224,6 225-226,4 227-229,5 230,6 231-243,5 244,3 342,6 346,8 348,6 353,6 357,6 363-365,6 374,7 376,6 393,5 394,4 397,1 431-435,6 436-439,5 440-443,7

Items included - 2 5 7-9 11-13 16 18 20-21 29 33 35 37-38 43-44 50 54-56 60-61 63-64 69-70 72-74 79 83-84 87-91 101 105 107 110 113-115 118 121 123-124 126-128 130 132-135 140-142 149-150 155-157 159 162 166-169 173-174 180-181 184-185 187 190 192 197 199 201-203

Key 3.

Characters – 447 in data, 261 included, 73 in key.

Items – 206 in data, 58 included, 87 in key.

RBASE = 1.40, ABASE = 2.00, REUSE = 1.01, VARYWT = .70

Preset characters (character,column:group) - 64,1:1 70,2:2 46,2:3 131,4:4 46,5:15 109,6:13

Characters included - 3-6 8-55 61-104 106-244 342 346 348 353 357 363-365 374 376 393-394 397 431-443

Character reliabilities - 3,7 4,6 5-6,7 8-13,7 14,6 15,5 16-17,7 18,6 19-21,7 22,5 23,7 24,6 25-26,8 27-29,7 30,1 31-36,7 37-38,6 39-42,7 43,5 44,1 45-46,7 47-48,4 49,5 50,8 51,6 52-55,7 61-64,7 65,6 66-68,7 69,6 70-72,7 73-74,5 75-81,7 82,4 83-88,7 89,6 90-94,7 95,5 96-104,7 106,1 107-116,7 117,5 118,6 119-142,7 143,8 144-151,7 152,5 153-155,7 156,8 157-165,7 166,5 167,8 168-173,7 174,6 175-181,7 182,8 183-189,7 190,5 191-193,7 194,6 195-213,7 214-220,4 221,2 222,5 223,4 224,6 225-226,4 227-229,5 230,6 231-243,5 244,3 342,8 346,8 348,8 353,8 357,8 363-365,8 374,8 376,8 393,5 394,4 397,1 431-435,8 436-443,7

Items included - 1 19 22-24 26 28 31-32 36 42 46 49 52 57-59 62 65-66 68 71 74-75 77 80-81 86 98-100 102-104 109 111-112 117 119 125 131 139 145-146 148 154 164-165 170 172 182 186 188-189 191 193 204 206

Key 4.

Characters – 447 in data, 261 included, 92 in key.

Items – 206 in data, 67 included, 100 in key.

RBASE = 1.40, ABASE = 2.00, REUSE = 1.01, VARYWT = .70

Preset characters (character,column:group) - 46,1:1 111,2:1 111,2:2 123,4:1 180,4:4 434,6:4 52,11:4 107,15:3

Characters included - 3-6 8-55 61-104 106-244 342 346 348 353 357 363-365 374 376 393-394 397 431-443

Character reliabilities - 3-4,6 5-6,7 8-11,7 12,6 13,7 14,6 15,5 16-17,7 18,6 19-21,7 22,5 23,7 24,6 25-26,8 27,5 28-29,7 30,1 31-36,7 37-38,6 39-42,7 43,5 44,1 45-46,7 47-48,4 49,5 50,8 51,6 52-55,7 61-64,7 65,6 66-68,7 69,6 70-72,7 73-74,5 75-81,7 82,4 83-88,7 89,6 90-94,7 95,5 96-104,7 106,1 107-116,7 117,5 118,6 119-142,7 143,8 144-151,7 152,5 153-155,7 156,8 157-165,7 166,5 167,8 168-169,7 170,5 171-173,7 174,6 175-177,7 178,5 179-180,7 181-182,8 183-187,7 188,8 189,7 190,5 191-193,7 194,6 195-205,7 206,6 207-208,7 209,5 210,7 211,4 212,7 213,6 214-220,4 221,2 222,5 223-226,4 227-229,5 230,6 231-239,5 240,4 241-242,5 243,4 244,3 342,8 346,6 348,8 353,6 357,6 363,8 364-365,6 374,6 376,6 393,5 394,4 397,1 431-432,6 433-434,7 435,6 436-439,5 440-443,7

Items included - 3-4 6 10-11 13-15 24-28 30-31 34 36 39-41 47-48 51-53 59 67 71 76-78 82 85 92-97 108-109 111 120 122 136-138 143-144 147 151-153 160-161 163 171-172 175-179 189 195 200 204

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GLOSSARY

abaxial: the side away from the central axis (opposite: *adaxial*). →

achene: a small dry indehiscent fruit with a single seed and a thin pericarp. True achenes may not occur in Poaceae, but in a few genera (e.g. *Pentameris*) a caryopsis that resembles an achene is formed when the endocarp and/or mesocarp collapses at a late stage of development (see *caryopsis*, *utricle*).

acicular: needle-shaped, i.e., narrow, stiff, pointed, and round in cross-section (a solid shape). →

acropetal: development from the base towards the tip, i.e., with the youngest cells at the base and maturing toward the tip (see *basipetal*).

acuminate: tapering gradually to a point, with the sides of the apex somewhat concave. →

acute: tapering to a point, with the sides of the apex straight or somewhat convex. →

adaxial: the side toward the central axis (opposite: *abaxial*). →

adnate: united with another organ (compare *appressed*).

adventive: a non-indigenous species that is established in a new region but is not expanding its range (compare *naturalized*).

amplexicaul: with the base of a leaf blade clasping the stem. →

annual: completing the life cycle in a year, usually passing the unfavourable season as a seed (see *biennial*, *perennial*).

annular: ring-like, or arranged in a circle.

anther: the part of a stamen that contains the pollen (see *filament*, also Fig. 8, p. 11).

anthesis: the period during which the flower is open and pollination takes place.

antrorse: pointing upward or forward (opposite: *retorse*).

apical: at or towards the apex (opposite: *basal*). →

apiculate: tipped abruptly with a small sharp point. →

apomixis: asexual production of seeds.

appressed: pressed against another organ, but not united with it (compare *adnate*).

arenicolous: growing in sand.

aristate: tipped with a bristle-like point. →

articles: segments of a structure that separate at maturity.

articulate: with a joint between parts that separate cleanly at maturity.

articulation: a joint, e.g. between the column and the lower part of the lemma in *Aristida* and *Stipagrostis*.

ascending: curved upwards and approaching erect. →

auricle: an ear-like outgrowth, e.g. of the leaf sheath mouth or blade base (see Fig. 5, p. 7).

awn: a long thin stiff appendage at the tip (or less commonly from the back or base) of a glume, lemma or palea (see Pl. 10, 12, 13, p. 358).

axil: the angle between a stem and its branch (or leaf).

axis: a generalized term for the main stem of the plant, of an inflorescence or of inflorescence parts such as racemes or spikelets (plural: axes).

basal: at or towards the base (opposite: *apical*). →

basipetal: development from the tip toward the base, i.e., with the youngest cells at the tip and maturing toward the base (see *acropetal*).

beak: in *Aristida*, a slight narrowing of the lemma below the awns, as distinct from a longer straight *column*.

bearded: with a tuft of long stiff hairs.

biennial: living two years, setting seed and dying in the second year; rare in grasses (*Pentaschistis*) (see *annual*, *perennial*).

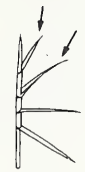
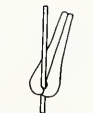
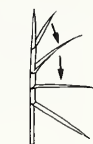
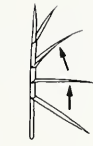
bifid: cleft into two lobes at the tip. →

biseriate: lying side-by-side on one side of the rachis (see *distichous*).

blade: the part of the leaf distal to the sheath and ligule (see Fig. 5, p. 7).

bract: a reduced leaf in the inflorescence, including structures such as spathes, spatheoles, glumes, lemmas and paleas.

C₃: photosynthesis in which atmospheric carbon is first fixed in three-carbon chains. It is indicated anatomically by the



separation of chlorenchymatous cells from the nearest PCR cells by two to many other chlorenchymatous cells (see *C₄*).

C₄: photosynthesis in which atmospheric carbon is first fixed in four-carbon chains. It is indicated anatomically by the separation of chlorenchymatous cells from the nearest PCR cells by no more than one other chlorenchymatous cell (see *C₃*).

caespitose: growing in tufts, e.g. *Hypparrhenia hirta*.

callus: a hard projection at the base of a floret, spikelet or inflorescence segment that aids in seed dispersal.

capillary: very fine and hair-like.

capitate: forming head-like clusters.

carinate: boat-shaped with one median keel (a solid shape).



cartilaginous: tough but elastic.

caryopsis: the fruit ('grain') of most grasses, in which the seed coat is adnate to the pericarp (see *achene*, *utricle*).

cataphyll: scale-like leaf on rhizomes, stolons or at plant bases (see Fig. 3, p. 5).

caudate: with a long tail-like tip.



chartaceous: papery in texture and usually not green in colour.

chasmogamous: with the florets opening for pollination (see *cleistogamous*).

ciliate: fringed with spreading, stiff hairs.

ciliolate: minutely ciliate.

clavate: club-shaped (a solid shape).



clavellate: barely clavate.

cleistogamous: with the florets not opening for pollination, and therefore obligately self-fertilizing (see *chasmogamous*).

cleistogene: a floret that does not open for pollination.

column: 1) in *Aristida* and *Stipagrostis*, a straight structure between the apex of the lemma and the branching point of the awns (see *beak*); 2) in geniculate awns, the part of the awn below the bend that is often twisted (see Pls. 12 and 13, p. 358, respectively).

convolute: rolled from one side, with one margin inside and one outside (see *involute*).



cordate: heart-shaped, with rounded lobes (a solid shape).



coriaceous: leathery in texture.

crateriform: cup-shaped (a solid shape).



culm: the stem of a grass plant.

cuneate: wedge-shaped, widest near the apex and tapering to a narrow base (a solid shape).



cupuliform: cup-shaped (a solid shape).

deciduous: falling off naturally (abscising) at a particular stage of growth (see *persistent*).

decumbent: growing horizontally at the base and then curving upwards (see Fig. 4, p. 6).



deflexed: bent downward, but not to 180 degrees.

dentate: toothed, with teeth perpendicular to the margin.

dichotomous: with equally forked paired branches.

digitate: like the fingers of a hand, with the members arising from the same point.

dioecious: a species with separate male and female plants (see *monoecious*).

disarticulate: to break apart at the joints.

discoid: disc-shaped (a solid shape).

disseminule: the part of the plant released with the seeds and aiding their dispersal.

distal: farther from the point of attachment (opposite: *proximal*).



distichous: two-ranked, on opposite sides of a stem (see *biseriate*).

divaricate: spreading widely.

dorsal: an ambiguous term for the back, abaxial or outer surface of an organ (opposite: *ventral*). The term *abaxial* is preferable.

dorsiventral: the plane from the 'dorsal' (abaxial) to the 'ventral' (adaxial) surfaces; having distinct upper and lower faces.

dorsiventrally flattened: structures that are compressed on the adaxial and abaxial sides.

eglandular: without glands (see *gland*).

elaiosome: part of a disseminule specialized to accumulate oils that attract ants which disperse the seeds.

elliptic: rounded and broadest at the middle and gradually narrowed to both ends, with the width about 1/2 the length (a flat or outline shape).



embryo: the rudimentary plant inside the seed.

endemic: a species that is native to a particular area and occurs naturally nowhere else in the world (compare *indigenous*, *naturalized*).

endosperm: food reserve tissue in the seed, containing starch, oil and protein.

entire: with a continuous margin or apex, not indented in any way.

erect: growing straight up (see Fig. 4, p. 6).

erose: a margin or apex that is irregularly notched, as if gnawed.

exserted: projecting beyond a containing structure (opposite: *included*).

extravaginal: branching in which the young shoot breaks through the leaf sheath (see *intravaginal*).

falcate: sickle-shaped (a solid shape).

false spike: a very narrow panicle with the spikelets borne in tight clusters on much reduced side-branches, as in some species of *Setaria* and *Pennisetum* (see Fig. 6, p. 9).

fascicle: a fairly tight cluster.

female-fertile: florets (or spikelets) with an ovary that can develop into a fruit. Fertile stamens may or may not be present (see *sterile*).

filament: the stalk of a stamen (see *anther*, also Fig. 8, p. 11).

filiform: thread-like, cylindrical and very slender.

fimbriate: fringed with long slender processes.

flabellate: fan-shaped; applied to flattened basal leaf sheaths, e.g. in *Eustachys paspaloides* (a solid shape).

flexuous: 1) not rigid; 2) zig-zag or wavy.

floret: an individual grass flower, usually consisting of lodicules, stamens and a pistil enveloped by the lemma and palea.

fragile: easily broken, especially along a line of abscission.

free: a structure not united to any other structures.

fruit: the ripe ovary with its adnate parts, containing the seed. In most grasses it is difficult to distinguish the fruit (caryopsis) from the seed.

fusiform: spindle-shaped; slender, but broadest at the middle and tapering to both ends (a solid shape).

geniculate: bent abruptly, like a knee.

geophytic: plants with the growing point below the soil surface, often with bulb- or corm-like structures.

germination flap: a line of thinner tissue in hardened lemmas, that allows the root of the germinating embryo to emerge.

gibbous: swollen on one side, e.g. the lemma of *Sacciolepis* or *Nassella*.

glabrous: without hairs, but not necessarily smooth (opposite: *pubescent*).

gland: a secretory structure that can be either raised or depressed.

glaucous: covered with a greyish or whitish waxy bloom obscuring the natural colour.

globose: spherical (a solid shape, in contrast to *orbicular*).

glomerate: densely clustered in heads.

glume: one of a pair of empty bracts at the base of a spikelet.

glycophytic: receiving its moisture from fresh water (compare *halophytic*).

grain: the caryopsis or naked fruit of a grass.

granular: with a bumpy surface.

granulose: with a slightly bumpy surface.

halophytic: growing in salty water, or salty soil (compare *glycophytic*).

halophytic: growing in marshy places (see *mesophytic*, *xerophytic*).

hermaphrodite: bisexual; a plant, spikelet or floret with both male and female parts.

heterogamous: of different sexes, e.g., with sterile and female-fertile spikelets (see *homogamous*).

heteromorphic: of two different forms, e.g., paired sessile and pedicellate spikelets that differ in appearance (see *homomorphic*, also Pl. 92, p. 367).

heterospiculate: inflorescences with two different kinds of spikelets, e.g. male-fertile and female-fertile spikelets that differ in appearance.

hilum: the scar on the caryopsis marking the site of attachment of the pericarp and seed coat. It is on the side opposite the embryo.

hispid: hairy with bristly, straight, erect, stiff hairs.

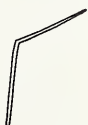
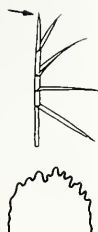
homogamous pairs: in Andropogoneae, spikelets of a pair that are similar to each other in sexuality (see Pl. 21, p. 359), in contrast to those which are paired but differ in sexuality (see *heterogamous*).

homomorphic: of similar form, e.g. pairs of spikelets in the Andropogoneae, in which the spikelets of the pair are similar to each other in form (see *heteromorphic*, also Pl. 21, p. 359).

hyaline: thin and transparent.

hydrophytic: growing in water.

imbricate: overlapping.



imperfect: a flower lacking functional male or female parts (opposite: *perfect*).

incised: cut or deeply toothed.



included: not protruding from a containing structure (opposite: *exserted*).

indigenous: a species native to a particular area, but not restricted to that area (compare *endemic*, *naturalized*).

indurated: hardened at maturity.

inflorescence: the spikelet-bearing system of branches (see Fig. 6, p. 9).

internode: the portion of a stem lying between two nodes.

interrupted: with broken continuity, applied to dense inflorescences with occasional gaps.

intravaginal: branching in which the young shoot emerges between the culm and the sheath mouth (see *extravaginal*).

introgression: a series of hybrid generations in which the hybrid individuals breed back to one parental species, eventually introducing into the parental species characteristics of the other.

invader: an indigenous or non-indigenous species that aggressively replaces natural vegetation (compare *naturalized*).

involucre: a series of bracts or bractlike structures below a spikelet or spikelet cluster, applied variously to the bristles of *Pennisetum* and *Setaria*, the sterile spikelets at the raceme bases in *Themeda* or the lower glumes in *Antherophora*.

involute: rolled from both margins toward the middle, thus with both margins inside (see *convolute*).



keel: a sharp fold or ridge on a compressed sheath, blade, glume, lemma or palea (see *carinate*).

Kranz anatomy: leaf blade anatomical organization usually associated with C_4 photosynthesis (see *non-Kranz anatomy*, as well as Fig. 1 and pp. 2–4 for particulars).

lacerate: torn at the edges or irregularly cleft.

lacunose: with depressions, or pitted with shallow irregular holes.

lanceolate: lance-shaped; widest in the basal third and gradually narrowed apically, approximately three times longer than wide (a flat or outline shape).



lateral: relating to the side. Spikelets whose lemmas are 1-keeled are usually 'laterally compressed'.

lemma: the lower of the two bracts enclosing the grass flower (see *palea* and Fig. 8, p. 11).

ligule: a membrane or line of hairs on the adaxial leaf surface at the junction of the sheath and the blade (see Fig. 5, p. 7). Uncommonly an external ligule, or contraligule, is present on the abaxial side also, as in *Alloterospis semialata*.



linear: long and narrow, with parallel sides, usually more than ten times longer than wide (a flat or outline shape).

lodicules: small rounded or scale-like structures at the base of the stamens and pistil in the grass flower which become turgid at anthesis, thus opening the lemma and palea (see Fig. 8, p. 11).

maritime: growing by the sea.

membranous: thin and semitransparent but not dry.

mesophytic: growing in places with fairly abundant moisture (see *helophytic*, *xerophytic*).

midrib: the main central vein of a leaf (see Fig. 5, p. 7).

monoecious: plants bearing both male and female flowers on the same individual (see *dioecious*).

mucro: a minute sharp point or shortly excurrent central nerve.

mucronate: with a mucro or mucros.



muricate: rough with sharp, hard, irregular protruberances.

muticous: blunt, without a point.

NAD-ME: a biochemical variant of C_4 photosynthesis in which aspartate compounds are formed (see *NADP-ME* and *PCK*, as well as Fig. 1 and pp. 2–4 for particulars).

NADP-ME: a biochemical variant of C_4 photosynthesis in which malate compounds are formed (see *NAD-ME* and *PCK*, as well as Fig. 1 and pp. 2–4 for particulars).

naturalized: a non-indigenous species that forms self-sustaining populations under local conditions and is capable of expanding its range (compare *adventive*, *endemic*, *indigenous*, *invader*).

nerves: the 'veins' of the blades, glumes, lemmas and paleas.

node: the part of the stem where leaves and/or branches arise (see Fig. 5, p. 7).

nodding: bent over and hanging down.

non-Kranz anatomy: leaf blade anatomy indicative of C_3 photosynthesis (see *Kranz anatomy*, as well as Fig. 1 and pp. 2–4 for particulars).

oblate: broadly elliptic.

oblong: with parallel sides and longer than wide (a flat or outline shape).

obovate: rounded, broadest above the middle and narrower toward the base (a flat or outline shape, see *ovate*).

obtuse: blunt and rounded at the apex (a flat or outline shape).

orbicular: round (a flat or outline shape, in contrast to *globose*).

ovary: the female part of the flower enclosing the ovule that develops into the seed (see Fig. 8, p. 11).

ovate: like the outline of a hen's egg, broadest below the middle and narrower toward the apex (a flat or outline shape, see *obovate*).

paired: spikelets occurring in groups of two, usually with one spikelet short-pedicellate or sessile and the other long-pedicellate (see Pl. 165, p. 375).

palea: the upper of the two bracts enclosing the grass flower (see *lemma* and Fig. 8, p. 11).

pallid: pale in colour.

panicle: an inflorescence in which the primary axis bears branched secondary axes and pedicellate spikelets (see Fig. 6, p. 9).

papillate (or papillose): having small protuberances (papillae).

partial inflorescences: portions of the large compound inflorescence in *Andropogoneae*, separated from each other by leaves, spathes and spatheoles (see Fig. 6, p. 9).

PCA tissue: in plants with C_4 photosynthesis, specialized mesophyll tissue where primary carbon assimilation from atmospheric CO_2 takes place (see *PCR tissue*).

PCK: a biochemical variant of C_4 photosynthesis, in which aspartate compounds are formed (see *NAD-ME* and *NADP-ME*, as well as Fig. 1 and pp. 2-4 for particulars).

PCR tissue: in plants with C_4 photosynthesis, specialized cells, often but not always sheathing the vascular bundles, where secondary carbon reduction takes place (see *PCA tissue*).

pectinate: comb-like.

pedicel: the stalk of the spikelet (see Fig. 7, p. 10).

pedicellate: with a pedicel (see *sessile*).

peduncle: 1) the specialized uppermost part of a culm bearing an inflorescence; 2) the stalk of a raceme or cluster of spikelets.

penicillate: with a tuft of fine hairs at the tip.

perennial: a plant that lives for more than two years (see *annual*, *biennial*).

perfect: a flower with both male and female parts functional (opposite: *imperfect*).

pericarp: the outer layer of the grass fruit, formed from the wall of the ovary.

persistent: remaining attached for a long time, usually after other parts have been shed (see *deciduous*).

pilose: hairy with very long, soft, rather straight hairs, not dense but somewhat shaggy.

pistillate: bearing pistils only and no stamens; the term may be applied to a flower, a floret, a spikelet, an inflorescence or an entire plant (see *staminate*).

plicate: folded lengthwise several times (pleated).

procumbent: lying on the ground but not rooting at the nodes (see Fig. 4, p. 6).

prophyll: a scale-like modified leaf with two keels.

prostrate: lying flat on the ground.

proximal: nearer to the base or point of attachment (opposite: *distal*).

pseudopetiolate: a grass leaf in which the blade is narrowed to a slender stem-like structure just distal to its junction with the sheath.

puberulent: hairy with very short, erect, straight hairs barely visible to the naked eye.

pubescent: a generalized term for hairy, lacking definition of the type of hairs (opposite: *glabrous*).

punctiform: in the shape of a dot or point.

pungent: sharp-pointed.

raceme: an unbranched inflorescence in which the primary axis directly bears pedicellate spikelets (see Fig. 6, p. 9).

rachilla: the axis of a spikelet.

rachis: the axis of a spike or raceme.

radical: pertaining to the roots.

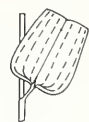
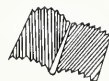
reflexed: abruptly bent downward or backward to about 180 degrees.

retorse: pointing downward or backward (opposite: *antrorse*).

rhizome: an underground stem (see *stolon* and Fig. 3, p. 5).

rhizomatous: with a rhizome.

rosette: a spreading and radiating basal cluster of leaves.



rugose: wrinkled and ridged, *e.g.* the female-fertile lemma of *Panicum maximum*.

saccate: bag- or sac-shaped, as in the lower lemma of *Sacciolepis* (a solid shape).

sagittate: arrowhead-shaped; with downward pointing acute lobes at the base (a solid shape).

scaberulous: minutely scabrous.

scabrid, scabrous: rough to the touch, with minute teeth or scattered short broad-based harsh hairs.

scandent: scrambling, often on other plants.

scarious: thin, dry and shrivelled, not green.

secund: one-sided, or arranged on one side.

sensu lato: a Latin phrase meaning 'interpreted in a broad sense' (abbreviated: *s.l.*). For example, *Melinis s.l.* means all the species assigned to the genus, including those formerly classified in *Rhynchelytrum* (see *sensu stricto*).

sensu stricto: a Latin phrase meaning 'interpreted in a narrow sense' (abbreviated: *s.s.*). For example, *Melinis s.s.* means the species assigned to the genus before *Rhynchelytrum* was included in it (see *sensu lato*).

sessile: without a pedicel (see *pedicellate*).

setaceous: bristle-like.

setae: bristles.

sheath: the basal part of a grass leaf that is normally wrapped around the culm (see Fig 5, p. 7).

sinus: the angle between two lobes.

spathe: a bract or bladeless leaf sheathing the inflorescence or a major component of it.

spatheole: a secondary spathe within a compound inflorescence in the Andropogoneae.

spike: an inflorescence in which a single axis bears sessile spikelets (see Fig. 6, p. 9).

spikelet: the basic unit of a grass inflorescence, composed of glumes, rachilla and florets (see Fig. 7, p. 10 and Fig. 8, p. 11).

spreading: held outward, at about right angles to the main axis.

stamen: the pollen-bearing part of a flower, usually composed of *filament* and *anther* (see Fig. 8, p. 11).

staminate: bearing stamens only and no pistils; the term may be applied to a flower, a floret, a spikelet, an inflorescence or an entire plant (see *pistillate*).

sterile: without functional male or female parts. An ambiguous term, in the past sometimes used to mean 'not producing seed or pollen' (Chippindall 1955) and sometimes meaning 'without pistils...may be staminate or neuter' (Hitchcock & Chase 1950), thus leaving male fertility in doubt (see *female-fertile*).

stigma: the part of the pistil that receives the pollen (see Fig. 8, p. 11).

stipe: a stalk to an organ that is part of the organ itself and not a separate branch.

stipitate: with a stipe.

stolon: a stem that creeps above the ground, roots and gives rise to new plants (see *rhizome* and Fig. 3, p. 5).

stoloniferous: with a stolon.

striate: with fine parallel lines or ridges.

styles: branches of the pistil that bear the stigmas (see Fig. 8, p. 11).

sub-: slightly or somewhat less than.

subulate: awl-shaped; tapering from base to apex and usually sharp-pointed (a solid shape).

sulcate: with a groove or furrow.

sward: lawn; continuous grass cover produced by stoloniferous species.

taxon: an invented term that signifies any taxonomic group irrespective of its classification level.

terete: cylindric and slender.

tiller: a leafy side-branch from a main culm, which may eventually flower, sometimes beginning in one year and flowering in the second year.

tomentose: hairy with somewhat matted, curly, wooly hairs appressed to the surface.

triad: three spikelets borne together (see Pl. 38, p. 361 and Pl. 209, p. 380).

trifid: 3-branched.

trigonus: 3-sided, with the sides convex (a solid shape).

triquetrous: 3-sided, with the sides concave (a solid shape).

truncate: ending abruptly as if cut off.

tuberculate: a surface with small projections.

tussock: a dense tuft (Afrikaans: *pol*).

utricle: a bladderly fruit in which the seed coat is separate from the pericarp; true utricles may not occur in Poaceae, but



utricle-like caryopses occur mainly in *Sporobolus*, *Eleusine* and a few other chloridoids (see *caryopsis*).

vascularization: the pattern of vascular tissue (veins, nerves, xylem and phloem) in an organ.

ventral: an ambiguous term for the front, adaxial or inner surface of an organ (see *dorsal*). The term *adaxial* is preferable.

verrucose: a surface with warts or nodules.

villous: hairy with moderately erect, dense, long, soft, often curly hairs.

viscid: sticky.

viviparous: young plantlets being produced within the parental inflorescence.

whorled: with several branches arising from a single node.

winged: with a thin projection or border.

woolly: hairy with dense, long, soft, entangled, curled hairs not appressed to the surface.

xerophytic: growing in arid places (see *helophytic*, *mesophytic*).

XyMS+: a code that signifies the presence of mestome sheath cells between the large metaxylem elements and the PCR sheath cells in primary vascular bundles (see *XyMS-*, as well as Fig. 1 and pp. 2–4 for particulars).

XyMS-: a code that signifies the absence of mestome sheath cells between the large metaxylem elements and the PCR sheath cells in primary vascular bundles (see *XyMS+*, as well as Fig. 1 and pp. 2–4 for particulars).

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... while the years have lengthened and the grass has grown.

MEMOIRS OF THE BOTANICAL SURVEY OF SOUTH AFRICA
MEMOIRS VAN DIE BOTANIESE OPNAME VAN SUID-AFRIKA

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ISBN 0 620 14846 2

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Printed and bound by Gutenberg Book Printers, Pretoria West



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